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COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW
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HENNIGER (H.). **Untersuchungen zur Entwicklung und Variabilität von Pseudopeziza tracheiphila Müller-Thurgau.** [Studies on the development and variability of *Pseudopeziza tracheiphila* Müller-Thurgau.]—*Phytopath. Z.*, 22, 1, pp. 1–34, 10 figs., 7 graphs, 1954.

The results of preliminary studies on the biology of *Pseudopeziza tracheiphila*, intended to serve as a basis for the eventual breeding of vines for resistance to rotbrenner, are fully reported from the Institute for Phytopathology, Naumburg, Germany [*R.A.M.*, 8, p. 701; 20, p. 289]. Apothecia developed only on malt agar under humid conditions. Yellowish-brown to nearly white or dark brown 'pseudoapothecia', closely resembling the apothecia but remaining sterile, were also formed on the same substratum (their numbers increasing progressively with rising concentrations of malt from 0·5 to 6 per cent.) at 100 per cent. relative humidity. The fungus is homothallic, but the sexual organs are under-developed and 'functionless'. Hyphal fusion was not seen, the hyphae being already in the dikaryotic phase shortly after ascospore germination. The analysis of a number of monoascospore cultures demonstrated the segregation of *P. tracheiphila* into biotypes with well-marked morphological and physiological differences.

The addition of vitamin B_1 to a synthetic medium appreciably promoted the growth of the fungus, and a further acceleration was effected by the introduction of minute quantities of yeast extract. Increasing concentrations of saccharose and agar (beyond 4 per cent.) stimulated mycelial development on Czapek's agar at the expense of the spiral convolutions representing the rudiments of apothecia.

SICK (E.) & HUGLIN (P.). **Sur une pourriture pédonculaire de la Vigne produite par 'Botrytis cinerea'.** [On a peduncular rot of Vine caused by *Botrytis cinerea*.] —*Progr. agric. vitic.*, 141, 8–9, pp. 114–121, 2 figs., 1954.

In further field experiments in Alsace-Lorraine in 1953 on Riesling and Gewürztraminer vines attacked by stalk rot caused by *Botrytis cinerea* [*R.A.M.*, 33, p. 701], the protective effect of copper products was too weak to justify their use as a specific treatment. Of the other fungicides, a 1 per cent. solution of the product S (based on captan) again proved effective, reducing rot incidence to one-third or one-half that of the untreated.

TAYLOR (R. H.). **Black spot of the Vine—new recommendations for control.**—*J. Dep. Agric. Vict.*, 52, 8, pp. 370–374, 5 figs., 4 graphs, 1954.

Experiments on the control of vine black spot [*Elsinoe ampelina*: see next abstract] conducted from 1950 to 1954 on Block 38 H, Woorinen, Victoria [*R.A.M.*, 32, p. 116] demonstrated the marked efficiency of ziram and thiram; these materials do not require to be used on dormant vines provided that complete cover is maintained from the week of bud-burst. Ziram is, on the whole, preferable to thiram as

most of the Victorian vine areas are deficient in zinc. The concentration required is 1·5 lb. of the 80 per cent. dispersable powder per 100 gals. or 2·4 lb. of the 50 per cent. paste. The rate of application should be 10 to 15 gals. per acre at bud-burst, increasing to 30 to 40 gals. for the final spray at about fruit set, pressure being maintained at 200 lb. per sq. in. and the sprays applied at fortnightly intervals, the minimum number where black spot builds up rapidly being three. The varieties Sultana, Waltham, and Chanez [cf. 33, p. 67] are susceptible in the dried fruit areas; Brown Muscat, Greenache, Chasselas, Alicante, Bouschet, and Palomino are affected in wet years. Blue Imperial and Shiraz seldom need to be sprayed. As the first application may take over a week it should be commenced before bud-burst.

DURQUÉTY (P.-M.). **Anomalies pigmentaires et morphologiques chez le Vitis vinifera L.** [Pigmentary and morphological anomalies in *Vitis vinifera* L.]—*C.R. Acad. Sci., Paris*, 239, 8, pp. 593–595, 4 figs., 1954.

Genetic anomalies in 90 to 100 per cent. of the sexually propagated progeny of certain vine stocks cultivated in the south-west of France, e.g., petit Verdau, Merlau rouge, and Cot, give rise to various forms of foliar mosaic and mottling, including one reminiscent of infectious degeneration [court-noué], and asymmetry or other morphological alterations, such as displaced tendrils, double nodes, fasciation, abnormal extension of the leaf blade or its total disappearance through necrosis, and so forth [*R.A.M.*, 33, p. 464 and next abstract].

DURQUÉTY (P.-M.). **Au sujet des anomalies pigmentaires et morphologiques chez le Vitis vinifera L.** [On the subject of pigmentary and morphological anomalies in *Vitis vinifera* L.]—*C.R. Acad. Sci., Paris*, 239, 14, pp. 826–828, 2 graphs, 1954.

From the results of studies on the progeny derived from self-fertilization of vines affected by the pigmentary and morphological anomalies previously described [see preceding abstract], the author postulates the existence of a 'factor', varying from year to year, which controls the development of genetic mosaic in the cotyledons.

CIFERRI (FIORELLA). **Carenza di potassio della Vite curata per via fogliare.** [Potassium deficiency of the Vine cured through the leaves.]—*Notiz. Malatt. Piante, 1954*, 26 (N.S. 5), pp. 11–14, 1954.

In an experiment carried out at the Institute of Plant Pathology, University of Milan, on potted Cyclopica vines about three years old showing the first symptoms of potassium deficiency [cf. *R.A.M.*, 31, pp. 420, 592], spraying the aerial parts only six times at weekly intervals from 26th May to 31st June with 1 per cent. crystallized commercial potassium sulphate eliminated all signs of the deficiency and increased the dry weight of potassium in the leaf. On non-treated vines the symptoms became progressively more marked.

SNYDER (E.) & HARMON (F. N.). **Some responses of Vinifera Grapes to zinc sulphate.** —*Proc. Amer. Soc. hort. Sci.*, 63, pp. 91–94, 1954.

The application of a weak zinc sulphate solution (½ lb. per gal.) to fresh pruning wounds of Muscat of Alexandria vines at Fresno, California [*R.A.M.*, 22, p. 7], in December, resulted in a higher yield and less bud injury than a 2 lb. per gal. solution. In February and March the stronger solution was more effective as a post-pruning treatment. Better results were obtained by applying the solution immediately after pruning than by delaying the operation for one to three days. Good control of little leaf [due to zinc deficiency: 31, p. 532] was given by summer foliage sprays of zinc sulphate-lime (20–10–100).

SMITH (K. M.). **Some virus diseases of vegetables and ornamental plants.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 569–573, 1953. [French summary.]

This paper is a brief discussion of the plant viruses of greatest importance to British horticulturists, and includes cucumber mosaic, tomato spotted wilt, cabbage black ring spot, and tobacco mosaic on tomatoes. Two recently described viruses on *Tropaeolum* [*majus*: *R.A.M.*, 30, p. 40] have been called Tropaeolum ring spot and Tropaeolum mosaic; both are insect-transmitted; the mosaic may be related to the cabbage black ring spot virus.

BALDACCI (E.) & MARINI (E.). **Aspetti citologici e istofisiologici nelle malattie da virus dei vegetali e loro possibili interpretazioni.** [Cytological and histo-physiological aspects of plant virus diseases and their possible interpretations.]—*Atti* (*VIII*) *Congr. naz. Microbiol.*, *1952*, pp. 219–243, 1 fig., 1952. [English summary.]

In this review, based largely on the literature, the authors seek to demonstrate the physio-pathological process which determines, in some common virus diseases of plants, the complex previously defined as a 'developmental' or auxonic disease [*R.A.M.*, 29, p. 164], with reference to cytological modifications and biochemical studies.

MCWHORTER (F. P.). **The utility of flower tissues for making inocula for difficult virus isolations.**—Abs. in *Phytopathology*, 43, 9, p. 479, 1953.

Two virus-plant associations were investigated [at Oregon Agricultural Experiment Station] to determine the relative value of flowers and leaves as material for inoculation tests [see next abstract]. Inoculum prepared from gladiolus flowers with white streak caused by cucumber mosaic virus was only four times as effective as that from the foliage, but cherry blossoms with latent virus complex [loc. cit.] were outstandingly superior to the leaves. In one series of tests inoculum from flowers induced 440 lesions on cowpea and leaf material none.

It is considered possible that flower tissues may contain fewer substances inhibiting the transfer of virus infections [cf. *R.A.M.*, 31, p. 121] than the leaves.

MILBRATH (J. A.). **Transmission of the components of the stonefruit latent virus complex to Cowpea and Cucumber from Cherry flower petals.**—Abs. in *Phytopathology*, 43, 9, pp. 479–480, 1953.

When inocula from tip leaves and flower petals of Montmorency sour cherries containing latent viruses [see preceding abstract] were compared [at Oregon Agricultural Experiment Station] on cowpea and cucumber [cf. *R.A.M.*, 33, p. 159], the leaf material induced the symptoms typical of the ring spot complex on the latter host but no symptoms on the former, while the flower inoculum caused the formation of numerous necrotic lesions on the primary leaves of cowpea and chlorotic spots with a white centre on cucumber cotyledons. Only occasionally did cucumbers react to petal inoculum by the development of ring spot symptoms.

SCHRAMM (G.). **Die Biochemie der Viren.** [The biochemistry of viruses.]—276 pp., 33 figs., 17 diags., 17 graphs, Berlin, Springer-Verlag, 1954. DM. 36.

This treatise, Volume 5 in the series 'Organische Chemie in Einzeldarstellungen' [Organic Chemistry in Monographs], represents an attempt to survey the properties and effects of plant and animal viruses as a whole from the standpoint of biochemistry. It is divided into two parts, A (general) and B (special). Part A comprises 11 chapters: I, an introduction (pp. 1–5); II, classification and nomenclature of viruses (pp. 5–12); III, demonstration and quantitative determination (pp. 12–20); IV, purification (pp. 20–33); V, size and shape (pp. 33–56); VI, electrochemical, VII, chemical, and VIII, immunological properties (pp. 56–59,

59–72, 73–80); IX, virus and host (pp. 80–113); X, mutation of viruses (pp. 113–118); and XI, control of virus diseases (pp. 118–123).

Among the 12 chapters of part B the first four are of phytopathological interest, dealing, respectively, with the crystalline (pp. 124–133), rod-shaped (pp. 133–175), and large plant viruses, multiplying in insects (p. 175), and bacteriophages (pp. 175–184).

KÖHLER (E.). **Pflanzenpathogene Viren.** [Plant-pathogenic viruses.]—*Fortschr. Bot.*, 15, pp. 476–512, 1 fig., 2 graphs, 1954.

This is a supplement to Volume 2 of the sixth edition of Sorauer's 'Handbook of plant diseases' (1953), treating of virus diseases [*R.A.M.*, 33, p. 580], and is concerned almost exclusively with papers on the subject published in 1951 and 1952.

FRANDSEN (N. O.). **Das Nomenklaturproblem der phytopathogenen Viren.** [The nomenclature problem of the phytopathogenic viruses.]—*Z. PflKrankh.*, 61, 5, pp. 241–247, 1954. [English summary.]

Discussing the various systems of plant virus nomenclature proposed of recent years [*R.A.M.*, 32, p. 469], the author favours the early adoption of an international code based on Holmes's binomial system [cf. 31, p. 221]. Its application is considered to be justified by the pattern of variation within the viruses as types, comparable to species, and their tendency towards grouping on a higher level, analogous to genera.

BEEMSTER (A. B. R.), VAN SLOGTEREN (D. H. M.), & THUNG (T. H.). **De inactivering van plantenviren.** [The inactivation of plant viruses.]—*Meded. Dir. Tuinb.*, 17, 3, pp. 165–170, 1954. [English summary.]

The authors briefly review 25 contributions to the literature on plant virus inactivation and conclude that heat treatment is the sole effective technique known at present, and that only to a limited extent. All other methods are still in the experimental stage.

MARAMOROSCH (K.). **Biological transmission of plant viruses by animal vectors.**—*Trans. N.Y. Acad. Sci.*, Ser. II, 16, 4, pp. 189–195, 1954.

Most of the 43 papers consulted by the author in the compilation of his up-to-date survey of the role of animal vectors in plant virus transmission have been noticed from time to time in this *Review*.

MILLER (P. R.). **A new leafhopper-borne virus disease from the Netherlands.**—*F.A.O. Pl. Prot. Bull.*, 2, 5, pp. 66–67, 2 figs., 1954.

The author states that as a result of work by K. Maramorosch [see preceding abstract] it appears possible that unrecorded plant viruses may be present in many leafhopper species that are symptomless vectors and often support the multiplication of the viruses they transmit. An intensive study of viruses harboured by leafhoppers may yield information of basic importance.

Until recently no plant virus diseases transmitted by leafhoppers had been reported from Western Europe, though the evidence suggested that the 'Pfeffinger' disease of cherries [*R.A.M.*, 33, pp. 298, 304; 34, p. 80], hop nettlehead [31, p. 350], potato witches' broom [31, p. 628], and *Rubus* stunt virus of raspberry [33, p. 541] might be leafhopper-borne.

VAN SLOGTEREN (E.). **The serological diagnosis of plant diseases caused by viruses.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 564–569, 2 pl., 1953. [French summary.]

Agglutination tests carried out in Holland for diagnosing the presence of plant viruses are described. Effective antisera have been prepared [*R.A.M.*, 32,

p. 144] for the diagnosis of a number of viruses, including potato virus S (new), tobacco rattle virus, onion mosaic (related to bean yellow mosaic virus), freesia mosaic viruses 1 and 2, hyacinth mottle virus, iris mosaic virus, and four narcissus viruses (yellow stripe, mosaic, silver leaf, and brown or chocolate spotting). This method has facilitated the production of virus-free seed potatoes and the sanitation of flower bulb cultivation.

MATTHEWS (R. E. F.). **Effects of some purine analogues on Tobacco mosaic virus.** —*J. gen. Microbiol.*, 10, 3, pp. 521–532, 2 graphs, 1954.

The results of these studies at the Plant Virus Research Unit, Molteno Institute, Cambridge, concerning the incorporation of 8-azaguanine [guanazolo] into the nucleic acid of tobacco mosaic virus and the resultant delay in infectivity and in the development of systemic infection have already been noticed briefly from another source [*R.A.M.*, 32, p. 515]. A serological-chromatographic method employed for estimating small amounts of the virus in crude plant extracts consists in grinding frozen leaf samples in a small volume of water, heating the suspension to 55° [C.] for five minutes, and removing the green precipitate by centrifugation. The supernatant fluid is mixed with a small, previously determined excess of an anti-tobacco mosaic virus serum and the mixture incubated for an hour at 50° and overnight at room temperature. The specific precipitate is centrifuged down, washed with 0·14 M sodium chloride solution, dried, digested overnight in a known quantity of 2 N potassium hydroxide, and neutralized with chloric acid; the potassium chlorate precipitate is centrifuged off. Portions of the supernatant fluid are then subjected to chromatography in the *iso*-propanol+ammonia solvent. The guanylic acid and mononucleotide spots are then eluted in 0·1 N hydrochloric acid and estimated spectrophotometrically. This method is useful for amounts of virus in the range 0·2 to 10 mg., giving recoveries round 90 per cent.

WILKINSON (J.). **The effects of 'aspermy' virus upon nuclear behaviour in certain solanaceous plants.**—*Proc. Soc. Stud. Fertility*, 4, pp. 53–54, 1 pl., [1952].

Further work at University College, Exeter, on the effects of tomato aspermy virus demonstrated that infected *Nicotiana glutinosa* [*R.A.M.*, 32, p. 457] and *N. rustica* plants contained small elongated hemispherical particles not present in the controls. Tobacco gave no conclusive results. The virus induces in *N. glutinosa* [cf. 31, p. 635] a collapse of the chromosome threads in the first meiotic prophase similar to the 'bouquet' stage in animals.

LEONARD (B. R.), ANDEREGG (J. W.), SHULMAN (S.), KAESBERG (P.), & BEEMAN (W. W.). **An X-ray investigation of the sizes and hydrations of three spherical virus macromolecules in solution.**—*Biochim. biophys. Acta*, 12, 2, pp. 499–507, 6 graphs, 1953. [French and German summaries.]

At the Department of Physics, University of Wisconsin, Madison, measurements were taken of the small-angle X-ray scattering from dilute aqueous solutions of southern bean mosaic, tobacco necrosis, and tomato bushy stunt viruses [cf. next abstract], the particles of all of which are subspherical. Values of the sphere diameter obtained by a comparison of the resultant curves with those of the exact scattering function for spheres are southern bean mosaic = 286 A, tobacco necrosis = 280 A, and tomato bushy stunt = 309 A. It appears very probable, from a comparison of these values with other molecular constants, that the particles of the three viruses are internally hydrated.

SCHMIDT (P.), KAESBERG (P.), & BEEMAN (W. W.). **Small-angle X-ray scattering from Turnip yellow mosaic virus.**—*Biochim. biophys. Acta*, 14, 1, pp. 1–11, 6 graphs, 1954.

The results of small-angle X-ray scattering measurements from solutions of

turnip yellow mosaic virus [cf. preceding abstract] and the associated protein [*R.A.M.*, 32, p. 227; 33, p. 368] indicate that both particles are subspherical with a radius of 140 A. The virus is of approximately uniform electron density. The protein is a water-filled, spherical shell with a ratio of inner to outer radius of 0·75. The above-mentioned value of 140 A represents the radius of the protein structure excluding external hydration. Both particles, therefore, have large internal hydrations.

MOORE (W. C.). **International trade in plants and the need for healthy planting material.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 552–558, 1953. [French summary.]

Recent international conventions have been held to overcome initial difficulties in ensuring the import and export of healthy planting material. National plant disease surveys and certification schemes are necessary, as is close co-operation between government officials, plant pathologists, exporters, and importers, in order to facilitate trade and maintain adequate pest control.

Izveštaji poljoprivrednih i šumarskih naučno-istraživačkih ustanova F N R J o radu na području zaštite bilja od 1945–1951 godine. [Reports from the agricultural and forestry scientific research institutes of the F N R Y on work in the field of plant protection from 1945 to 1951.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1952*, 13–14, 183 pp., 22 figs., 1952. [French and English summaries.]

Much of the information given in these reports from various parts of Yugoslavia [cf. *R.A.M.*, 34, p. 20], covering the period from 1945 to 1951, has already been noticed from other sources [33, pp. 13, 279, *et passim*]. The best control of apple scab (*Venturia inaequalis*) [31, p. 612] was obtained with dormant sprays of Bordeaux mixture (3 per cent.) followed by lime-sulphur during the period after flowering. Copper sulphate, anhydrous copper sulphate, and Sumbarita all proved excellent against *Taphrina deformans* on peach [31, p. 594] and Bordeaux mixture (1 per cent.), applied immediately after flowering, against *Polystigma rubrum* on plum [16, p. 392]. Fruit stocks were best disinfected against *Bacterium tumefaciens* [8, p. 401] by ceresan (0·1 per cent.) and copper sulphate (1 per cent.). *Sclerotinia cinerea* [*S. fructigena*] on sour cherry [9, p. 626] was controlled satisfactorily with Bordeaux mixture (1 per cent.) or barvicol (2 per cent., containing DNC). *Clasterosporium carpophilum* was very widespread on apricots [C.M.I. map No. 188] and caused much damage to the fruit.

Septoria helianthi on sunflower [cf. *R.A.M.*, 30, pp. 79, 309] is believed to overwinter on diseased plant parts in the soil.

None of the bean [*Phaseolus vulgaris*] varieties tested was resistant to *Pseudomonas medicaginis* var. [f. sp.] *phaseolicola* [34, p. 20], but a few [unspecified] broad bean varieties showed resistance to *Uromyces fabae* [33, p. 279], though their progenies were not homozygous for resistance. Considerable lettuce losses in 1951 were due to *Marssonina panattoniana* [C.M.I. map No. 82].

The native wheat lines 845/46, 822, and Concours 25 were resistant to *Puccinia triticina* [*R.A.M.*, 33, p. 286] and Novosadska 5038, Novosadska 1446, and Kankurz 1205 to *Tilletia laevis* [*T. foetida*: 31, p. 323].

The *dosis curativa* recommended against *Sorosporium reilianum* [*Sphacelotheca reiliana*] on maize [33, p. 280] ranges between 0·0125 and 0·025 per cent. for wettable ceresan and between 0·025 and 0·05 per cent. for copper sulphate mixture. In field experiments mercury fungicides were most effective at the rate of 150 gm. per 100 kg. seed.

One treatment of potatoes against blight (*Phytophthora infestans*) [32, p. 587] with 1 per cent. Bordeaux mixture increased the total yield by 2,300 kg. per ha.; three treatments raised it by 17,500 kg. per ha. Three biotypes of the fungus were

found to be present in the country. *Colletotrichum atramentarium* [C.M.I. map No. 190] was observed on wilted or weakened potato plants. Potato viruses X [*R.A.M.*, 31, p. 349], Y [30, p. 535], and A [loc. cit.], potato leaf roll virus [9, p. 626], and purple top virus [cf. tomato big bud virus: 33, p. 621; cf. also 32, p. 234] are reported to be widespread. The last mentioned was also observed on tomatoes in 1946.

Sclerotium oryzae was recorded on rice [cf. 28, p. 239] in 1949 in Croatia.

Flax anthracnose (*Colletotrichum lini*) [*C. linicola*: C.M.I. map No. 159] was successfully controlled by treating seeds with ceresan (500 gm. per 100 kg. seed). Similarly, ceresan (550 gm.) gave good control of *Bacterium* [*Xanthomonas*] *malvacearum* on cotton [*R.A.M.*, 31, p. 605].

The vine varieties Mirisavi Traminac, Rulandec (Grey Pinot), Plavac, Red Traminac, and Rajnski Riesling showed some resistance to downy mildew (*Plasmopara viticola*) [33, p. 280] in Slovenia. During a severe and early attack of powdery mildew (*Uncinula necator*) [34, p. 20] in Serbia in 1950, good protection was obtained by spraying 15 days before flowering with lime-sulphur and during flowering and at the beginning of grape ripening with sulphur.

Melampsora pinitorqua was noticed for the first time in Slovenia on Canadian white and black poplars [*Populus* spp.: cf. 34, p. 117].

New records include *Helminthosporium gramineum* on barley [cf. 32, pp. 15, 239], *Ascochyta lycopersici* on tomato [cf. 25, p. 368], *Cercospora bolleana* on fig [cf. 26, p. 328], *Marssonina kirchneri* [cf. 27, p. 400] on *Anethum graveolens*, *Gloeosporium caulivorum* [*Kabatiella caulivora*] on red clover [cf. 13, p. 382; 25, pp. 203, 455], *Uromyces caryophyllinus* [*U. dianthi*] on carnation [cf. 32, p. 561], *Fusarium oxysporum* var. [f.] *gladioli* on gladiolus [cf. 33, p. 73], and *Bacterium* [*Pseudomonas*] *maculicola* on cabbage [cf. 31, p. 97].

Thirty-fourth Report of the Quebec Society for the Protection of Plants, 1952.—63 pp., 2 figs., 1953. [Received 1954.]

In this report [cf. *R.A.M.*, 33, p. 466], J. Simard and T. Simard (pp. 43–44) state [in French] that cabbage yellows (*Fusarium oxysporum* var. *conglutinans*) [*F. conglutinans*: 32, p. 543] occurred again in Montreal in 1952. Varietal trials showed a percentage infection ranging from 38·3 (Copenhagen Market) to 90·3 (Green Acres).

The control of potato blight (*Phytophthora infestans*) [33, p. 139] in 1951 with a concentrated fungicide, such as dithane D-14 in a high-pressure sprayer, is described by K. M. Graham and J.-B. Julien (pp. 45–50) [in French, with English summary]. Twenty-five days after the application of two pints of dithane D-14 plus 1 lb. zinc sulphate in 33, 66, and 100 gals. per acre to the variety Green Mountain, the percentages of blighted leaves were 5, 5·3, and 5·8, respectively, compared with 98·5 on the unsprayed, the corresponding figures for the tubers being 0·03, 0·45, 0·16, and 19·18 per cent. blight. Zinc sulphate caused slight leaf scorching but its omission reduced the efficiency of the spray.

In further comparative fungicide tests against apple scab [*Venturia inaequalis*] at Rougement [33, p. 467], L. Cinq-Mars and R. Crête (pp. 51–54) state [in French] that they attribute severe summer scab infection to four rains in May and June, 1951. Dry periods in July and August facilitated control, but rain at the end of August and during September caused scab spotting on apples at picking time. The best control of scab (eight treatments) on both leaves and fruit (2·03 and 3·43 per cent. scab, respectively) was provided by ferbam, with magnetic 70 (2·63 and 9·14) next. Mulsoid was the least effective (2·86 and 44·73).

Simmonds (J. H.). **Science Branch.**—*Rep. Dep. Agric. Qd, 1952–53*, pp. 60–63, 1 fig., 1953.

It is stated in this report [cf. *R.A.M.*, 33, p. 208] that frost damage to the wheat

crop was very severe in 1952–3 and of greater economic importance than parasitic diseases. Powdery mildew [*Erysiphe graminis*: loc. cit.] caused considerable leaf damage early in the season. Of the root rots observed, *Rhizoctonia* [*Corticium*] *solani* [30, p. 22; 33, p. 356] was the most important, particularly on the Darling Downs, affecting some 30 per cent. of the crop on soils with low nitrogen content. Take-all (*Ophiobolus graminis*) [31, p. 429], observed on a 200-acre planting of the variety Celebration in the Pittsworth district, has not previously been recorded in Queensland.

Field and glasshouse experiments on cowpea stem rot (*Phytophthora* sp.) [33, p. 136] have shown that it is soil-borne, a high mortality being secured by growing plants in infested soil.

Field trials against brown rot (*Sclerotinia fructicola*) on peaches [30, p. 331] and nectarines [loc. cit.] and against pear scab [*Venturia pirina*: 33, p. 94] indicate that spraying with thiram [loc. cit.; 33, p. 733] will probably replace the older methods of control.

A strawberry fruit rot due to an undetermined species of *Rhizoctonia* was widespread. Leaf blight (*Dendrophoma obscurans*) [23, p. 378], appearing in an epiphytotic form and causing partial to complete defoliation during December, was responsible for severe plant losses in areas with inadequate irrigation. Copper sprays [cf. 33, p. 489] gave good protection to healthy leaves and allowed treated plants to survive until rainy weather.

Heart rot or infectious chlorosis of bananas [? due to cucumber mosaic virus: cf. 29, p. 316 and below, p. 138] appeared in the heart rot stage on 5 per cent. of the plants (first year plantation) examined in December, while 30 per cent. of the stools in another plantation in February showed mosaic symptoms.

Pineapple top rot (*Phytophthora cinnamomi*) [29, p. 407] was common during the winter, particularly on shallow soils; bedding up proved advantageous.

Papaw fruits displayed varietal susceptibility to ripe fruit rots and to cold injury. Severe ripe fruit spotting, caused by *Gloeosporium* spp., *Ascochyta caricae* [23, p. 448], and *Phomopsis* sp., occurred on fruit maturing slowly in the early, colder part of the season and on fruit with poor ripening qualities. Spotting due to *Alternaria* sp., however, occurred only later on in the season after the decline of that caused by other fungi.

Rust [*Uromyces appendiculatus*: 33, p. 210] is still one of the most serious diseases of beans [*Phaseolus vulgaris*]. Several sources of resistance have, however, been observed and selection and crossing are in progress. Sulphur dusting gave outstanding control but not corresponding yield increases because of the low infection levels during the trial.

A severe attack of cucumber downy mildew [*Pseudoperonospora cubensis*: 29, p. 203] followed the heavy summer rains. In fungicide trials at Rochedale Bordeaux mixture (4:4:40) and copper oxychloride (2:40) were more effective than some of the newer, organic fungicides. Palmetto showed good resistance to downy mildew but was very susceptible to anthracnose [*Colletotrichum lagenarium*].

Among the other diseases noticed are *Cytospora* sp. associated with girdling and die-back of 20 sugar gum trees (*Eucalyptus cladocalyx*) at Pittsworth; *Pestalottzia* [*Pestalotia*] *funerea* associated with the extensive die-back of a *Cupressus* hedge [cf. 28, p. 272] at Toowoomba; *Phyllosticta cammelliicola* var. *meranensis* [cf. 27, p. 126] on *Camellia japonica*, and *Coniothyrium fuckelii* on rose.

Wright (J.). **Annual Report of the Department of Agriculture, Jamaica, for the year ended 31st December, 1952.**—41 pp., 1953. [Received 1954.]

The information in the section of this report [cf. *R.A.M.*, 33, p. 212] dealing with plant diseases (p. 14) has already been noticed from another source [33, p. 590].

TARR (S. A. J.). **Diseases of economic crops in the Sudan. II. Fibers, oil seeds, Coffee and Tobacco.**—*F.A.O. Pl. Prot. Bull.*, **2**, 11, pp. 161–165, 1954.

Sesame in the Sudan is commonly attacked by a bacterial blight ('blood disease'), the symptoms of which resemble those caused by *Pseudomonas sesami* [*R.A.M.*, 30, p. 158] in India and elsewhere. It can cause serious losses, and would probably become very destructive under conditions of intensive cultivation; at present, the crop is grown locally in relatively small, scattered patches. Powdery mildew (*Sphaerotheca fuliginea*) [33, p. 411] occurs on sesame in most areas; early attacks may cause considerable damage.

Rosette virus disease occasionally causes appreciable losses to groundnuts [33, p. 759] in the extreme south, apparently the only part of the country where the disease is present. Of leaf-spotting pathogens, common on groundnuts in wet areas, only *Cercospora arachidicola* [C.M.I. map No. 166] and *C. personata* [No. 152; cf. *R.A.M.*, 32, p. 90] are of importance; both are widely prevalent in parts where the annual rainfall exceeds 20 to 25 in. *Ricinus communis* in the Gezira and the area to the south is frequently and sometimes severely attacked by bacterial blight, probably due to *Xanthomonas ricinicola* [cf. 31, p. 536; 33, p. 181]. Sunflower rust (*Puccinia helianthi*) [C.M.I. map No. 195] is sometimes severe in central and southern Sudan. Safflower rust (*P. carthami*) occurs occasionally, but only in the extreme north, where rain seldom falls. In the southern Sudan coffee rust (*Hemileia vastatrix*) [No. 5] is widespread, especially on *Coffea arabica*, and causes appreciable loss. 'Brown eye' leaf spot (*Cercospora coffeicola*) [No. 59], very prevalent in the wetter areas, sometimes causes considerable leaf damage. Tobacco is affected by leaf curl, probably caused by the leaf curl virus [No. 147]; *C. nicotianae* [No. 172] is very prevalent on tobacco in regions where the annual rainfall exceeds 15 to 20 in. and often markedly reduces the quality of the leaf; it is a potentially serious factor in the future expansion of tobacco-growing in the wetter areas of the Sudan.

BRIANT (A. K.). **Annual Report of the Department of Agriculture, Zanzibar Protectorate, 1953.**—29 pp., 1954.

In this report [cf. *R.A.M.*, 33, p. 411] it is stated that the 1953–4 clove crop is likely to equal or exceed the bumper crop of 1950–1. Furthermore, it was obtained with the minimum of severe branch breaking, indicating the success of the campaign for more careful picking and demonstrating that wounding is the commonest mode of entry for the die-back fungus (*Cryptosporella* [*eugeniae*: 34, p. 64]). Further demonstrations of die-back control in Pemba, where two teams of pruners are working on both Government and privately owned plantations, resulted in some improvements in technique. It has been observed that clove saplings sheltered by *Cassia siamea* shade trees and windbreaks provided for cacao at Mlangoni and Selem have shown exceptional vegetative vigour, their leafy canopies having been restored after 'slow decline' [loc. cit.]. It appears, therefore, that although the decline may be initiated by *Valsa eugeniae* infection, the degree of parasitism of the fungus and the extent to which the trees are affected are markedly influenced by and may be dependent on the existence of soil and environmental conditions unfavourable to the growth of the trees. Experiments to ascertain this are to be conducted at Kizimbani. During the year nearly 250,000 selected clove seedlings were distributed to growers from nurseries established and maintained by the Department of Agriculture.

Late in the year there was a severe outbreak of what was believed to be withertip (*Gloeosporium limetticola*) [cf. 33, p. 708; C.M.I. map No. 119] on limes in Government demonstration plots at Dole and on young plants in the budding nursery. It also occurred to a lesser extent in other areas. The disease has not been recorded hitherto in Zanzibar; it constitutes a serious threat to the projected lime-oil industry if it turns out to be suited to the dry conditions of the lime-growing areas.

The serious fall of some 183,000 ripe oranges similar to that in several previous seasons in the citrus block at Kizimbani Experiment Station may be due to water-logging. Trenches 3 ft. deep have been dug to drain part of the area.

Outbreaks and new records.—*F.A.O. Pl. Prot. Bull.*, 2, 10, pp. 154–157, 1954.

In this summarized account of observations on virus diseases made by Dr. C. J. Magee during a visit to Papua and New Guinea in July and August, 1951, it is stated that bunchy top [virus] on abaca (*Musa textilis*), growing at the Lowlands Agricultural Experiment Station, Keravat, near Rebaul [*R.A.M.*, 32, p. 304; cf. 33, p. 723], is probably a chronic form which appears to affect the plants only during the early stages of growth. This view was supported by the fact that the Fijian banana variety Veimama and the Tangongon and Bangkura varieties of *M. textilis* are considered to have recovered partially from bunchy top infection. Although the insect vector (*Pentalonia nigronervosa*) is abundant in the Territory, there were no signs of any spread of bunchy top virus to bananas or wild species of *Musa* from the abaca stocks at Keravat. All abaca stocks were destroyed [32, p. 304] and about 30,000 seedlings are being raised in nurseries.

The acute form of banana mosaic (strain of cucumber mosaic virus) [cf. 31, p. 119 and above, p. 136] was found on two occasions only in native gardens on the Gazelle Peninsula, where bananas were interplanted with vegetables. The disease was thought to have been spread to the few affected banana plants by *Aphis gossypii* which had migrated from vegetable crops.

Banana leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: cf. 33, p. 339] is present in all parts of the Territory except the Central Highlands of New Guinea, but is of little economic importance. The abaca variety grown at Keravat is highly resistant to, if not immune from, *M. musicola*.

Mosaic virus [cf. 31, p. 119] on maize was found only at Sogeri, near Port Moresby. Cucumber mosaic virus is widespread in the Territory and causes a number of diseases but no serious outbreaks were seen. Taro (*Colocasia* spp.) crops in most of the areas visited were affected by a mosaic disease possibly caused by cucumber mosaic virus. Nearly all the tobacco plants seen in the Lowland area were affected by tobacco mosaic virus. It was also present in the Highlands.

Miller (P. R.). **Plant disease situation in the United States.**—*F.A.O. Pl. Prot. Bull.*, 2, 10, pp. 148–150, 1954.

In 1953 a commercial nursery in Delaware reported a 75 per cent. loss in *multiflora* rose cuttings, 500,000 cuttings on 24 acres being involved. Normally a 10 per cent. loss is expected owing to rooting failure. The potential value of the planting was $10,000 to $16,000 per acre. The affected canes showed symptoms of crown canker (*Cylindrocladium scoparium*), apparently the first record of crown canker on roses in the field.

A new race 31 of bean rust (*Uromyces phaseoli* var. *typica*) [*U. appendiculatus*: *R.A.M.* 33, p. 698] was found in two collections from Pinto beans [*Phaseolus vulgaris*] from New Mexico. The differential bean varieties 643 and 650 are very susceptible, U.S. 3 and 765 are susceptible, and 780, 814, and Golden Gate Wax are resistant.

McKeen (W. E.). **An anatomical study of cane and crown galls.**—*Canad. J. Bot.*, 32, 4, pp. 527–530, 3 pl., 1954.

An anatomical study of galls occurring naturally on stems of boysenberry (*Rubus loganobaccus* hybrid) and Himalaya blackberry (*R. procerus*) revealed that they form on any part of the stem of flowering canes of plants systemically infected with *Agrobacterium* [*Bacterium*] *rubi* [*R.A.M.*, 30, p. 209] and originate from or near the cambial layer. The vascular system in galls caused by *B. rubi* and *A.* [*B.*]

tumefaciens on broad bean [loc. cit.], tomato, sugar beet, loganberry, and Himalaya blackberry plants is connected to the vascular system of the organ on which they are growing.

Alvim (P. de T.). **Studies on the cause of cherelle wilt of Cacao.**—*Turrialba*, 4, 2, pp. 72–78, 1 graph, 1954. [Spanish summary.]

A brief account of these studies at the La Lola experimental farm, Costa Rica, from 1951 to 1953 on cherelle wilt of cacao has already been noticed from another source [*R.A.M.*, 33, p. 713]. The disorder was induced in terminal branches bearing young fruits by reducing the number of leaves to less than six to nine per branch, and girdling them below the point of fruit attachment. Spraying the fruits with 20 and 50 p.p.m. *p*-chlorophenoxyacetic acid did not affect wilt incidence or fruit set. The author considers that in Costa Rica the disorder is the result of a disruption in the mechanism of food translocation to the young fruits.

Gray (Elizabeth G.). **Smut diseases of cereals in the north of Scotland.**—*Plant Path.*, 3, 2, pp. 59–62, 1954.

Wheat loose smut (*Ustilago nuda*) [*U. tritici*: *R.A.M.*, 21, p. 154] is to be found every year in many crops in Scotland, especially on the varieties Bersée, Eclipse, Fylgia, Hybrid 46, Karn, Picardie, Progress, and Vilmorin [33, p. 204], though infection seldom exceeds one per cent. Bunt (*Tilletia caries*) has been observed only at the trial grounds of the North of Scotland College of Agriculture, Craibstone. Loose smut of barley (*U. nuda*) ranged from 2 to 15 per cent. in 1949 in varieties like Carlsberg, Freja, Gold, Herta, Maja, and Regel, and increased markedly in susceptible varieties in 1952 and 1953. In one trial hot water treatment of seed reduced infection from 15 to 0·5 per cent. and increased yield by 6 to 7 bush. per acre. Two seed firms are now producing treated seed. There is no authenticated record of *U. nigra* on barley in north Scotland, and *U. hordei* is rare on the newer varieties. Similarly with oats, smuts (*U. avenae* and *U. hordei* [*U. kolleri*]) are now virtually confined to the older varieties. Both smuts, especially *U. kolleri*, cause abundant infection in crops of *Avena strigosa* in the Outer Hebrides, Orkney, and Shetland; S. 75 (Aberystwyth selection) is resistant and S. 171 nearly so. Inoculation tests showed that there appear to be two strains of *U. kolleri* in the north, one of which (Hebridean) attacks S. 171. All isolates of *U. avenae* reacted similarly, and in varietal trials infected with a mixed inoculum of all strains of both species nine lines of *A. strigosa* from the Scottish Society for Research in Plant Breeding, *A. brevis*, and *A. barbata*×*A. brevis* remained free from infection. On the mainland formaldehyde treatment consistently reduced to a trace both loose and covered smut of oats. Covered smut, in the few trials in which it developed, was almost completely controlled by an organo-mercurial dust. Against loose smut of oats, which occurred more frequently, short wet treatment with an organo-mercurial was effective; dusts, including organo-mercurials, were sometimes ineffective. Disinfection of barley seed with organo-mercurials gives good control of covered smut, but is little practised in crofting areas, where soil conditions favour infection. The disease seldom develops locally when infected seed is sown in normal arable soils.

Robinson (D. B.) & Ayers (G. W.). **A hitherto unreported ascomycete parasitic on the roots of Wheat, Oats, and Barley.**—*Canad. J. Bot.*, 32, 4, pp. 543–544, 2 pl., 1954.

A soil-inhabiting ascomycete, observed annually since 1937 in Prince Edward Island, chiefly on the roots of wheat and occasionally on oats and barley, but causing negligible damage, is designated *Cryptoascus graminis* n.sp. The irregularly oblong to ovoid, black, carbonaceous perithecia borne in clusters on a black stroma

measure 125 to 225 by 80 to 100 μ; the globose, gelatinous, hyaline asci 50 to 60 by 35 to 45 μ; and the dark, ovoid, granular or vacuolate ascospores 35 to 42 by 15 to 18 μ. No conidial state was observed.

ANDRÉN (F.). **1951–52 års betningsförsök met stråsäd.** [Cereal seed disinfection experiments in 1951–2.]—*Växtskyddsnotiser, Stockh., 1953*, 1, pp. 6–8, 1953.

In further cereal seed disinfection experiments conducted on the usual lines under the supervision of the Swedish Plant Protection Institute [*R.A.M.*, 32, p. 14 and next abstract], the incidence of bunt [*Tilletia caries*] in winter wheat was reduced from 208·1 diseased plants per 10 sq. m. to an average of less than one by aagrano (200 gm. per 100 kg.), betoxin F (200 ml.), hormotan (200 gm.), lunasan (200 gm.), and panogen (200 ml.). The average yield increase resulting from seed treatment was 6·5 per cent.

The best control of loose smut of oats [*Ustilago avenae*] was given by betoxin 61, hormotan, and panogen, all applied at the normal rate of 300 gm. per 100 kg., which reduced the number of diseased plants per 10 sq. m. from 111·8 to less than one. On an average seed treatment raised the yield by 4 per cent.

Stripe disease of barley [*Helminthosporium gramineum*] was appreciably less prevalent than usual, with 49·1 diseased plants per 10 sq. m. All the disinfectants reduced infection to a trace except aagrano (300 gm.), which permitted the development of 1·7 diseased plants per 10 sq. m. The average yield increase from seed treatment was 10 per cent.

ANDRÉN (F.). **Resultat av betningsförsök med stråsäd 1952–53.** [The results of cereal seed disinfection experiments in 1952–3.]—*Växtskyddsnotiser, Stockh., 1954*, 1, pp. 8–11, 1954.

During the period under review wheat bunt [*Tilletia caries*] was effectively combated at various experimental centres in Sweden [see preceding abstract] by all the standard preparations used either at 100 or 200 gm. per 100 kg. In general, the metal-free tritisan was equally efficient with the mercurials. The average number of diseased plants per 10 sq. m. in the treated plots ranged from 0·2 to 2·1, compared with 3,500 in the untreated. The maximum yield of 5,130 kg. per ha. was obtained by treatment with lunasan at 200 gm.

Applied at 300 gm. per 100 kg., all the fungicides reduced the number of oat plants infected by loose smut [*Ustilago avenae*] from 56 to a trace per 10 sq. m., as also did panogen 4930 (containing extra mercury) at half the rate. Betoxin 61 and panogen 4930 produced the heaviest yields, amounting to 3,270 kg. per ha. as against 3,190 for the untreated.

Almost equally satisfactory results in the control of barley stripe disease [*Helminthosporium gramineum*] were given by all the preparations tested, but the disease occurred only in a mild form, with 20·1 infected plants per 10 sq. m.

VALDEYRON (G.). **Rapport sur les travaux de recherche effectués en 1951.** [Report on the research work carried out in 1951.]—*Ann. Serv. bot. Tunis*, 23 (*1950*), *Suppl.*, 29 pp., 1952.

In the plant pathology section of this report [cf. *R.A.M.*, 30, p. 460] it is stated (pp. 21–23) that at the Phytopathological Laboratory, Botanical Service, Tunisia, hot water treatment of wheat seed gave very satisfactory control of *Ustilago tritici* [see next abstract]. Methoxyethyl mercuric silicate or chloride, phenyl mercury (1 per cent. mercury), ethyl mercury phosphate (3·5 per cent.), and methyl dicyanamide (0·8 per cent.) were all effective against smuts of oats and barley [*Ustilago* spp.] and wheat bunt (*Tilletia* sp.), the last compound giving the most consistent results. Aliphatic mercury thiochloride (1·25 per cent. mercury) controlled covered smut [*U. hordei*] of barley. Equally effective and more economical

were 10 per cent. hexachlorobenzene, 8 per cent. cupric chloride, and 20 to 30 per cent. cuprous chloride against *U. tritici*, formalin (0·3 per cent., 15 minutes' immersion) against loose smut of oats [*U. avenae*], and sulphur against *U. hordei*.

Valdeyron (G.). **Remarques sur l'évolution du charbon interne dans quelques cultures de multiplication de Florence × Aurore en Tunisie.** [Notes on the development of internal smut in some increase crops of Florence × Aurore in Tunisia.]—*C.R. Acad. Agric. Fr.*, 39, pp. 471–474, 1952.

In 1947 and 1948 Florence × Aurore wheat seed was treated with hot water at 52° [C.] against *Ustilago tritici* [see preceding abstract] and distributed to nine different localities in Tunisia, where the incidence of the disease in the 1948 to 1951 harvests was assessed. There was no close correlation between incidence in one season's crop and the amount of infection in seed derived from that crop. An apparently disease-free crop in 1948 was followed by one with slight infection in 1949. Contamination occurred mostly within the field or from the neighbouring fields not more than 200 to 300 m. away. Crops with high yields were the most severely attacked, except where irrigated. Climatic conditions in the spring favourable to wheat were equally so to the fungus. The Soul-el-Khemis region appears to be particularly favourable for smut development. It is suggested that hot water treatment should be confined to seed intended for multiplication purposes and that such seed should be grown in regions where there is little infection.

Freitas (A. P. Do C.). **Os métodos e os conceitos na diferenciação de Puccinia rubigo-vera f. sp. tritici (Erikss. & Henn.) Carl.** [Methods and concepts in the differentiation of *Puccinia rubigo-vera* f.sp. *tritici* (Erikss. & Henn.) Carl.] — *Broteria*, 23, 4, pp. 174–194, 2 figs., 1954. [English summary.]

The following proposals for the differentiation of physiologic races of wheat brown rust (*Puccinia rubigo-vera* f.sp. *tritici*) [*Puccinia triticina*: *R.A.M.*, 34, p. 88] are based on a critical study of 37 contributions to the literature. The eight differential hosts of Mains and Jackson [5, p. 477] should be retained as a basis of classification of physiologic races throughout the world. Descriptions of races should include indications of their reactions to environmental conditions, notably temperature and light. The effects produced by individual races on the differential hosts should be defined in broad terms of resistance, susceptibility, or heterogeneity, with the possible addition of any intermediate response. Biotypes should be graded according to Mains and Jackson's scale [loc. cit.] and included in the races to which they belong. Strains differentiated on wheats outside this range should be regarded as sub-races of those within it.

Fedorinchik (N. S.). Вирулентность и эффективность культуры паразита ржавчины **Darluca filum (Biv.) Cast.** [Virulence and effectiveness of a culture of the rust parasite *Darluca filum* (Biv.) Cast.]—Микробиология [*Microbiology, Moscow*], 21, 6, pp. 711–717, 1952.

At the Pan-Soviet Scientific Research Institute of Plant Protection, Leningrad, U.S.S.R., *Darluca filum* [*R.A.M.*, 18, p. 580] was grown successfully on sterile pieces of carrot and potato and on oat and maize grains. In greenhouse experiments with wheat artificially infected first with spore suspensions of *Puccinia triticina* [32, p. 551] and then, one to ten days later, with *D. filum* 98 per cent. of rust pustules were damaged. When *D. filum* was inoculated one to ten days earlier than *P. triticina* it still remained highly virulent. In simultaneous inoculations on wheat plants the parasite almost completely destroyed the rust in the mycelial stage. The cultures of *D. filum* were kept at 18° C. and 24°. Mass fructification occurred after one and a half to two months. The fungus can develop successfully

in the medium, retaining its virulence for 8 to 10 months. Fungus and substratum can be dried at 24° to 25° (not above) in three to four days (if the culture is spread out in a thin layer) and can be stored or transported in this condition without loss of virulence.

HIRATSUKA (N.) & MIYASHITA (S.). **Studies on the rust-resistance of cereals, IV. Susceptibility of various species of Agropyron, Elymus and Bromus to Puccinia graminis f.sp. tritici and P. triticina.**—*Jap. J. Breed.*, 4, 1, pp. 31–36, 1954. [Japanese, with English summary.]

The seedling reactions of species of *Agropyron*, *Elymus*, and *Bromus* to race 11 of *Puccinia graminis* f.sp. *tritici* and two biotypes of *P. triticina* were tested in Japan [cf. *R.A.M.*, 33, p. 531]. *A. kamoji* and six other *A.* spp. were immune from or highly resistant to *P.g. tritici*, two moderately resistant to resistant, and two (*A. griffithsii* and *A. repens*) susceptible. Two species of *Elymus* were highly resistant or immune, one was moderately resistant to resistant, and three were susceptible. Three species of *Bromus* were highly resistant or resistant, two semi-resistant to resistant, one resistant, two susceptible to moderately resistant, and four susceptible.

Nine species of *Agropyron* and five of *Elymus* were immune from or highly resistant to a biotype of race group 1 of *P. triticina*, while ten of *A.*, five of *E.*, and 17 of *Bromus* reacted comparably to a biotype of race group 6.

JOHNSON (T.). **Selfing studies with physiologic races of Wheat stem rust, Puccinia graminis var. tritici.**—*Canad. J. Bot.*, 32, 4, pp. 506–522, 1 pl., 1 fig., 1954.

At the Plant Pathology Laboratory, Winnipeg, Manitoba, 42 cultures of wheat stem rust (*Puccinia graminis* var. *tritici*), comprising 34 physiologic races, were subjected to selfing studies, each involving the inoculation of barberry plants with the sporidia of one race and the determination on differential wheat varieties of the races in the uredial cultures derived from the aecidiospores [*R.A.M.*, 34, p. 28]. In every culture pathogenicity appeared to be inherited according to the same principles. On Marquis and Kota wheat pathogenicity of the rust progeny tended to resemble that of the parent race. Avirulence was a dominant character and virulence recessive on Reliance, einkorn (*T. monococcum*), and Vernal (*T. dicoccum*) and the reverse on the durum wheats [32, p. 664] Arnautka, Mindum, and Spelmar. Although pathogenic variation occurred in the progenies of some races it did not transgress the circumscribed limits of the parent race. The population therefore consisted chiefly of biotypes of the same race.

HOLTON (C. S.). **Genetic phenomena in the smut fungi as related to the dynamics of the species.**—*Phytopathology*, 44, 7, pp. 352–355, 1954.

In a paper presented at the Symposium on Genetics of Phytopathogenic Fungi in Relation to Problems of Infectious Disease held at Madison, Wisconsin, on 7th September, 1953, the information hitherto accumulated on the genetics of the cereal smut fungi in relation to specific variability is summarized from the author's studies on wheat bunt (*Tilletia caries* and *T. foetida*) in Washington [*R.A.M.*, 30, p. 517; 33, p. 417, *et passim*] and 46 contributions to the literature, nearly all of which have been noticed from time to time in this *Review*. It is concluded that the factors governing such characters as culture type, spore morphology, gross morphology of the infected host, and pathogenicity are inherited independently, their segregation and recombination producing new morphological and genetic types. The interaction of these genetic phenomena is thought to be directly concerned in the highly dynamic nature of the Ustilaginales, both as regards morphology and pathogenicity.

Hess (N.) & Pichler (F.). **Versuche der mechanischen Bekämpfung des Weizensteinbrandes (Tilletia tritici).** [Experiments on the mechanical control of Wheat bunt (*Tilletia tritici*).]—*PflSchBer.*, 13, 11–12, pp. 177–182, 1 fig., 1954. [English summary.]

In experiments at the Plant Protection Institute, Vienna, and an Austrian seed selection establishment, wheat seed of the Ritzlhofer, Tassilo I, and Tassilo II varieties was completely freed from bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, 33, p. 716] by mechanical treatment with a specially constructed drum rotating at 400 revolutions per minute. However, germination was so severely impaired that this method of control cannot be recommended at present. The damage was counteracted to some extent by subsequent dusting of the seed with ceresan or hagesan (a phenyl mercury acetate compound) at 200 gm. per 100 kg.

Slinkard (A. E.) & Elliott (F. C.). **The effect of bunt incidence on the yield of Wheat in Eastern Washington.**—*Agron. J.*, 46, 10, pp. 439–441, 2 graphs, 1954.

In studies at Washington Agricultural Experiment Station, Pullman, the agronomically similar Elgin-Elmar and Federation-Federation 41 wheat mixtures were used, the variety of each pair resistant to bunt (*Tilletia caries* and *T. foetida*) [*R.A.M.*, 33, p. 417] being a back-cross derivative of the susceptible variety, thereby minimizing yield differentials between pairs. Variations in the incidence of infection were obtained by mixing the resistant and susceptible varieties of the pair in 10 per cent. increments, thus securing a range from completely resistant to completely susceptible. The resultant mixtures were then inoculated with one or more of the physiologic races of the smuts attacking only the susceptible component. The Elgin-Elmar mixtures were used for autumn sowing and those of Federation-Federation 41 for spring. Linear regression of yield on bunt percentage and the yield reduction percentage for each percentage increment of infection were calculated in the eight nurseries where the experiments were conducted.

Statistical analysis revealed a significant negative linear relationship between yield and percentage of smutted heads in all the nurseries. An increase in the average infection of individual nurseries was accompanied by a similar trend in the yield reduction of bushels per acre, as indicated by the regression coefficient. Thus, for each bushel per acre increase in average yield there was a corresponding average increase of 0·007316 in the negative value of the regression coefficient. However, when this relationship was placed on a percentage basis, each per cent. of bunt in the nurseries caused an average yield reduction of 0·77 per cent.

Haegermark (U.). **En inventering av ett par stråbassjukdomar.** [A survey of some straw base diseases.]—*Växtskyddsnotiser, Stockh., 1954*, 2–3, pp. 19–21, 2 figs., 3 maps, 1954.

Though eyespot was found on only about 22 per cent. of all stalks from 128 samples (of 50 to 70 stalks each) collected in July and August, 1952, from wheat fields in southern and central Sweden, *Cercosporella herpotrichoides* [*R.A.M.*, 33, p. 343; 34, p. 19] was isolated from 73 per cent. of the samples and 15 to 16 per cent. of the stalks; the corresponding figures for *Rhizoctonia* [*Corticium*] *solani* [cf. above, p. 136] were 36 and 3 per cent. It is concluded that *Cercosporella herpotrichoides* is of general occurrence, but comparison with similar investigations in south-eastern Sweden in 1951 and 1953 suggests that eyespot incidence in 1952 was unusually high.

Hrushovetz (S. B.). **The effect of infection by Helminthosporium sativum on the amino acid content of Wheat roots.**—*Canad. J. Bot.*, 32, 5, pp. 571–575, 1 pl., 1954.

At the Department of Biochemistry, University of Alberta, the amino acids present in roots of healthy wheat seedlings and those affected by *Helminthosporium*

sativum were determined by paper chromatography, maximum extraction being effected by treating the dried roots with 80 per cent. ethanol followed by acid hydrolysis. In all, 11 free and 13 combined amino acids were identified with evidence of four unidentified fractions. The total nitrogen in the diseased roots was higher on a dry weight basis than that of healthy roots and the aggregate content of both free and combined amino acids was slightly higher. The concentrations of free alanine, serine, and asparagine were double those in the healthy roots, possibly owing to an increase in nitrate absorption from the soil or to reduced translocation.

Sallans (B. J.) & Simmonds (P. M.). **The influence of variety and predisposing factors on the occurrence of yellow berry (starchiness) in Wheat.**—*Canad. J. agric. Sci.*, 34, 4, pp. 393–405, 1 graph, 1954.

This is a full account of work on yellowberry (starchiness) in wheat in Canada, already noticed from another source [*R.A.M.*, 33, p. 290]. Greenhouse experiments showed that lowering the moisture level of the soil reduced the incidence of this disorder.

Leben (C.) & Arny (D. C.). **Soaking treatments for the control of loose smut of Barley.**—*Phytopathology*, 44, 6, pp. 329–330, 1954.

The results of greenhouse and field experiments at the Department of Plant Pathology, University of Wisconsin, in 1951 and 1952 on the control of barley loose smut (*Ustilago nuda*) by 48 hours' immersion of naturally contaminated seed (pre-soaked for 10 to 12 hours in distilled water at 22° to 24° C.) in either fresh distilled water or 0·2 per cent. spergon SL substantiated those of Tyner [*R.A.M.*, 33, p. 78]. All the water treatments and most of those with spergon SL were effective against the pathogen, but the latter was uniformly phytotoxic and the former was injurious to the Mars variety and a grower's lot. The application of ceresan M to one lot of seed some time before the treatments did not appear to influence the results.

Crooke (W. M.), Hunter (J. G.), & Vergnano (Ornella). **The relationship between nickel toxicity and iron supply.**—*Ann. appl. Biol.*, 41, 2, pp. 311–324, 1954.

In further studies at the Macaulay Institute for Soil Research, Craigiebuckler, Aberdeen [*R.A.M.*, 33, p. 476], with oat plants in sand-and-water culture, nickel toxicity symptoms (necrosis and chlorosis) were less severe when the concentration of iron in the nutrient solution was high. Reduced necrosis was related to a reduced nickel content in the leaf blades and reduced chlorosis to the nickel–iron ratio in the leaf blades, an internal antagonism being indicated in the latter case. In the leaves the nickel content was reduced by high concentrations of iron in the nutrient solution and the iron content by high concentrations of nickel; the former effect was the more marked.

Nickel uptake increased with increasing pH for a constant iron level in the medium, though the degree of necrotic symptoms was similar over a pH range of 4 to 7. Iron uptake was reduced by both nickel and increasing pH, chlorosis occurring at pH 5·5 and above [cf. 33, p. 755]. For a constant iron level the phosphate content of stem extracts increased with increasing nickel toxicity; if the phosphorus status is related to nickel toxicity, it must be considered in relation to other factors.

Strahov (T. D.). Патологический процесс у растений и дегенерация возбудителей головни. I. Патологический процесс и факторы среды. II. Дегенерация возбудителей головни вне тканей растения и факторы среды. [The pathological process in the plant and degeneration of the causal agent of smut. I. The pathological process and environmental factors. II. Degeneration

of smut pathogens outside plant tissues and environmental factors.]—Микробиология [*Microbiology, Moscow*], 21, 6, pp. 705–710, 1952; 22, 2, pp. 185–193, 1 fig., 4 graphs, 1953.

The authors carried out investigations at the Institute of Genetics and Selection, U.S.S.R. Academy of Sciences, and the Scientific Research Institute of Biology, Gorky State University of Harkov, into the hypothesis that it should be possible to readjust the balance of mutual reaction between plants and parasites in favour of increasing resistance by changing the nutritive and cultural conditions. Thus, in field experiments in 1941 the average percentage infection of oats with loose smut [*Ustilago avenae*: *R.A.M.*, 18, p. 605] was reduced from 16·4 in the susceptible variety Harkovsky 596 to 5·6 and from 1·5 in the resistant Sovietsky 339 to 1 by means of a complete fertilizer; when iron sulphate also was added it was reduced to 1·6 and 0·3 in the two varieties, respectively, or with sodium chloride to 2 and 0·2.

In 1949 the addition of manganese or copper sulphate to the complete fertilizer or the use of nickel or manganese sulphate alone completely eliminated infection of barley with covered smut [*U. hordei*: loc. cit.] on the resistant Jubilee 1386, compared with 4 per cent. infection on plants receiving no fertilizer. Resistance of rye to stripe smut [*Urocystis occulta*: 30, p. 563] was increased considerably in 1948–9 by adding iron, nickel, or zinc sulphate, or boric acid, to the complete fertilizer resulting in 3·4, 4·8, 0·9, and 3·1 per cent. infection, respectively, as against 17·1 for the control.

Reactions, such as the change of catalase activity [32, p. 551], reminiscent of those in naturally immune varieties appear under the influence of fertilizers and micronutrients.

In the second paper it is stated that, contrary to the hitherto accepted belief that smut spores accumulate in the soil [cf. 24, p. 199], a rapid degeneration takes place, the basidiospores and germ mycelia being destroyed. The period during which soil may remain infective varies from several days to several months according to the smut species and the environmental conditions.

Ellis (R. T.). **Report on the incidence of Puccinia polysora Maize rust in Nyasaland during the growing season 1953/54.**—*Nyasald Farm. & For.*, 2, 2, pp. 48–52, 1954.

The presence of *Puccinia polysora* in Nyasaland [*R.A.M.*, 33, p. 226 and next abstract] was confirmed at Balaka and Lilongwe during 1953–4, but the only damage caused on a commercial scale was 100 per cent. infection on a susceptible Southern Rhodesian hybrid. *P. sorghi* [C.M.I. map No. 279] was also prevalent but caused no appreciable losses. The incidence of both rusts was reduced but not prevented by fortnightly sprays of blitane (2 lb. in 100 gals.) [see next abstract].

Ellis (R. T.). **Tolerance to the Maize rust Puccinia polysora Underw.**—*Nature, Lond.*, 174, 4439, p. 1021, 1954.

In a replicated trial at the Agricultural Research Station, Lilongwe, Nyasaland, sprays of blitane (zineb) affected the incidence of *Puccinia polysora* on maize [see preceding abstract] by reducing the score for the number of open uredosori (0 to 9) by about a half as compared with the unsprayed. An unsprayed hybrid received an average score of 3·5, a locally selected, open-pollinated variety 1·9, and an unselected, local, indigenous variety 1·6. The yield of the hybrid was reduced by 17 per cent., while that of the local varieties was unaffected, but the latter yielded far less than the hybrid even when it was fully attacked. Thus there is clear evidence of differences in varietal susceptibility and of tolerance [*R.A.M.*, 33, p. 420], though all three types gave the fully susceptible reaction when tested for juvenile resistance in the greenhouse.

Pate (J. B.) & Harvey (P. H.). **Studies on the inheritance of resistance in Corn to Helminthosporium maydis leaf spot.**—*Agron. J.*, 46, 10, pp. 442–445, 2 figs., 1954.

At the North Carolina Agricultural Experiment Station, Raleigh, inbred lines of maize, selfed progenies from plants in one-time back-crosses, F_2 populations, and single crosses of resistant, intermediate, and susceptible lines were tested for reaction to leaf spot (*Helminthosporium maydis*) [*Cochliobolus heterostrophus*: *R.A.M.*, 33, p. 217 *et passim*] in field epiphytotics initiated by artificial infection. Variations in reaction were continuous and ranged from very resistant to very susceptible. Resistance was partially dominant in the single crosses. The response of the back-cross progenies involving NC18 indicated a dominance of the resistance factors carried by this resistant line. The possibility of transgressive segregation in a number of segregating populations indicated that factors for resistance may be either additive or complementary or both.

Michaelson (Merle E.). **Factors affecting development of stalk rot of Corn caused by Diplodia zeae and Gibberella zeae.**—*Diss. Abstr.*, 14, 3, p. 434, 1954.

Some of this information from the University of Minnesota has already been noticed from another source [*R.A.M.*, 33, p. 719]. The studies also demonstrated that the maize stalk rot fungi *Diplodia zeae* and *Gibberella zeae* may attack the same internode and grow together without apparent antagonism. Rot developed more rapidly at 85° F. than at 65° to 75° in the laboratory and greenhouse but was less severe in soil flooded with water or deficient in nitrogen. The greatest amount of rot resulted from inoculations made about the time of pollination and in the succeeding weeks. Inoculated plants with a large smut [*Ustilago maydis*] gall near the top developed more rot than non-smutted plants, as did those in which the leaves were broken or removed prior to inoculation. On the other hand, plants in which the ears were removed were less susceptible. The tunnels made by the maize borer [*Pyrausta nubilalis*] or equivalent mechanical damage did not appear to increase susceptibility to rot, though decay invariably follows borer damage.

Chowdhury (S.). **Deficiency diseases of Citrus in Assam, India.**—*F.A.O. Pl. Prot. Bull.*, 2, 10, pp. 151–153, 2 figs., 1954.

In Assam citrus mottle leaf due to zinc deficiency [cf. *R.A.M.*, 31, p. 541; 32, p. 177] prevails wherever the loose-skinned mandarin (*Citrus reticulata*) is grown. In most orchards 5 to 25 per cent. of the mandarin trees are affected, but incidence occasionally reaches 60 per cent. The disorder is less common and less serious in other species of citrus. Trees grown under dry conditions or in soil lacking organic matter are those most severely affected. In hill plantings trees high up are more frequently affected than those lower down.

Chlorosis due to iron deficiency [cf. 32, p. 429; 33, pp. 26, 350] is not as widespread or as serious as mottle leaf. It mostly affects the loose-skinned mandarin, and more rarely Valencia [orange] and lime. Mandarins grown in unsatisfactory soil conditions are those most commonly affected; for this reason the disorder is prevalent on the southern slopes of the Khasi and Jainta Hills and on the North Cachar Hills. Locally, the condition may sometimes be corrected by spraying with iron salts, preferably ferrous sulphate (1 lb. per 1,000 gals. water), with blood albumen (4 oz. per 100 gals.) as a spreader. Affected trees generally recover after one or two applications, the first in February or March, the second in July or August; the effect persists for two to three years if the trees are grown under good cultural conditions.

Daraseliya (N. A.). О наличии в почве бактерий антагонистов к **Phoma tracheiphila** возбудителю «мальсекко». [On the presence in the soil of bacteria antagonistic to *Phoma tracheiphila*, the causal agent of 'mal secco'.]—Микробиология [*Microbiology, Moscow*], 22, 2, pp. 203–205, 1953.

In studies at the Laboratory of the Pan-Soviet Scientific Research Institute, U.S.S.R., cultures of [unspecified] bacteria, isolated from the rhizosphere of a tea bush, were antagonistic to *Phoma* [*Deuterophoma*] *tracheiphila* [*R.A.M.*, 33, p. 720] both in pure culture and on infected citrus branches. Bacterial strain No. 2 was the most active and under laboratory conditions was able to lyse the mycelium of the fungus.

Luc (M.). **Sur trois champignons du Palmier à huile en Côte d'Ivoire.** [On three fungi of the Oil Palm in the Ivory Coast.]—*Rev. Mycol.*, 18, *Suppl. colon.* 2, pp. 94–102, 3 figs., 1953. [Received September, 1954.]

The fungi most frequently isolated in the Lower Ivory Coast from decaying leaves of oil palms affected by 'leaf bend' [cf. *R.A.M.*, 29, p. 11] included *Fusarium* spp., *Penicillium* spp., *Acrostalagmus koningii* [*Trichoderma viride*: 18, p. 761; cf. 28, p. 523], *Pestalotia palmarum* [29, p. 412], *Botryodiplodia theobromae*, *Monilia sitophila*, *Entosordaria deightonii* (also described on the same host from Sierra Leone [32, p. 512]), and two new species, *Selenophoma elaeidis* and *Noemosphaera elaeidis* [both without Latin diagnoses].

E. deightonii caused the production of large, discoloured patches up to 40 cm. long at the base of the petioles of old leaves that had been cut down and left. Lenticular, subcuticular perithecia measuring up to 750 μ in breadth and 550 μ in height were present on both surfaces of the petiole. The asci measured 290 to 345 by 12 to 15 μ and the ascospores 23 to 37 by 8 to 10 (average 30·3 by 9) μ.

S. elaeidis is characterized by brown, round, gregarious, superficial or slightly submerged pycnidia, 150 to 250 μ in diameter with a wall 15 to 20 μ thick. The pycnidiospores, lunate or sometimes only slightly falciform or curved almost into a circle, measure 12 to 20 by 1·6 to 2·2 μ.

N. elaeidis has spherical or subspherical pycnidia measuring 125 to 145 μ high and 85 to 135 μ in diameter, with a black, smooth wall and a neck 100 by up to 40 to 55 μ. The olivaceous, oval spores measure 2·5 to 3 by 1·7 to 2·3 μ.

Kovachich (W. G.). **Cercospora elaeidis leaf spot of the Oil Palm.**—*Trans. Brit. mycol. Soc.*, 37, 3, pp. 209–212, 1 pl., 2 figs., 1954.

The author describes the symptoms and control of leaf spot of young oil palms in the Belgian Congo [*R.A.M.*, 28, p. 31] and the microscopic characters, germination and penetration, and proof of pathogenicity of the causal organism (*Cercospora elaeidis*) [33, p. 351].

In inoculation experiments in the Research Department, Huilever S.A., Leopoldville, 75 per cent. of the conidia germinated after five days, each normally producing one or two germ-tubes. The typical brown spots appeared 21 days after inoculation. In general the germ-tubes on the upper leaf surface were shorter than those on the lower, probably owing to differences in the distribution of stomata. Typical symptoms appeared on the leaves of potted seedlings within five weeks of being brushed with a spore suspension of *C. elaeidis*. The one uninoculated control plant that became infected was in contact with an inoculated seedling.

Control recommendations include the burning of old leaves and transplanting nursery plants to the field as soon as possible. Spraying with Bordeaux 4–4–40 [loc. cit.] was shown to prevent conidial penetration entirely and reduce germination from 82 to 12·6 per cent. The substitution of hydrated lime for quicklime in the mixture is recommended to prevent burning.

Moreau (C.). **Glomerella cingulata (Ston.) Spauld. et Schr. sur Caféier à Madagascar.** [*Glomerella cingulata* (Ston.) Spauld. & Schr. on the Coffee bush in Madagascar.]—*Rev. Mycol.*, 18, *Suppl. colon.* 1, pp. 38–45, 2 figs., 1953.

An account is given of a study of the morphological characters, systematic position, and biology of *Glomerella cingulata*, isolated from the cambial region of the collar of coffee plants from Madagascar [*R.A.M.*, 27, p. 79] affected by root rot and from soil from the rhizosphere of these plants. The author considers that the fungus plays an important part in the wilting of the island's coffee plantations; various other hosts are also attacked locally [cf. 27, p. 80]. From a morphological study of the ascigerous state it is concluded that the fungus should be placed in the Pseudosphaeriales. The isolation of strictly conidial and ascigerous forms may be due to the occurrence of biological races.

Saccas (A.). **Une nouvelle espèce de Coleroa sur Caféier.** [A new species of *Coleroa* on the Coffee bush.]—*Rev. Mycol.*, 18, *Suppl. colon.* 1, pp. 46–49, 3 figs., 1953.

The leaves of *Coffea arabica* seedlings over two years old, growing in a nursery at the Central Station, Bukoko (Ubangui-Chari), French Equatorial Africa, at an elevation of 600 m. and in a very damp soil under conditions of saturated atmospheric humidity, bore on both surfaces large, irregular, necrotic, dark brown spots surrounded by a darker zone. On several occasions affected leaves fell in large numbers. The lesions bore superficial, black, almost carbonaceous perithecia of *Coleroa coffeicola* n.sp., generally occurring in groups and measuring 70 to 150 μ in diameter, with a round pore 5 to 8 μ. The cylindrical-claviform asci measured 25 to 32 by 5 to 7 μ, and the hyaline, cylindrical-ovoid, straight or slightly curved ascospores 6 to 8 by 1·5 to 2 μ. The fungus is considered to be only a secondary parasite, possibly a saprophyte; fructifications of *Mycosphaerella*, *Colletotrichum* [*Glomerella cingulata*: see preceding abstract], and *Cercospora coffeicola* were also present.

Wellman (F. L.). **Evidencia de resistencia a las enfermedades en los Cafetos.** [Evidence of resistance to diseases in Coffee bushes.]—*Turrialba*, 4, 2, pp. 52–57, 1954.

The author reviews, with reference to the literature (22 titles), the current situation with regard to breeding for resistance to coffee diseases in various parts of the world, with particular reference to *Hemileia vastatrix* [*R.A.M.*, 32, p. 185 and next abstract], emphasizes the need for an exchange of ideas between the eastern and western hemispheres, and indicates the lines of future work on this problem.

Mallamaire (A.). **La rouille vraie du Caféier causée par Hemileia vastatrix B. et Br. au Dahomey.** [True rust of Coffee caused by *Hemileia vastatrix* B. & Br. in Dahomey.]—*Bull. Cent. Rech. agron. Bingerville* 6, pp. 51–61, 1952. [Received 1954.]

During September, 1952, leaves of *Coffea arabica* and *C. canephora* var. Niaouli affected by *Hemileia vastatrix* were received from the Niaouli station, Dahomey. This is the first record in the area [C.M.I. map No. 5]. Although it is too early for the importance of the outbreak to be assessed accurately, yield reductions are tentatively estimated at 30 per cent. Since rigorous quarantine measures exclude the possibility of the disease having gained entry on plants or seeds from infected territories infection must have originated from air-borne spores probably from the Cameroons. Infections of several months' standing were found in several areas south of Niaouli.

Organized surveys revealed that *H. vastatrix* occurs within an area delimited by Abomey-Calavi, Tocomé, Zinvié, Dodji-Batta, Agon (to the east), Toffo, Lalo,

Azové, Parahoué (to the north), Ouédémé, Lokossa (to the west), and Logogbo, Couffonou, Tori-Bossito (to the south), i.e., more than 50 per cent. of the coffee-growing area. Therefore, unless all the coffee bushes in Dahomey can be destroyed within a very short time and the growers recompensed, nothing will prevent the disease from spreading throughout West Africa. Suggested local measures to enable infected bushes to continue in production comprise planting vigorous, regularly-pruned bushes, sprayed thoroughly with a good fungicide, in good, well-fertilized soil.

Of the varieties grown at the Niaouli station only an isolated mother plant, 34–21 Niaouli, was free from infection, but Robusta Java No. 72–01, Robusta Vinh Indochine, Excelsa Libonza, Excelsa Sumatra, Niaouli Jaune 57–05, Congensis Cogo (Madagascar), Libéria Côte d'Ivoire, Excelsa Java No. 121, Excelsa Java C.40, Excelsa Seac C.46, Excelsa Aruwimiensis, and Selections 9–18, 15–05, 38–01, P.34–21 (self-fertilized), 8–11 of P.38–04, 1–13 of P.N2, 1–04 of P.N1, and 2–16 of P.15–05 were only slightly affected.

Stewart (R. B.) & Whitehead (M. D.). **Nub root—an apparently undescribed disease of Cotton as expressed in the mature plant.**—Abs. in *Phytopathology*, 44, 6, p. 333, 1954.

In 1952 and 1953 the Texas cotton crop sustained widespread damage from 'nub root', characterized by sudden wilting, reduction, distortion, or absence of the tap-root and a tendency towards lateral-root proliferation under moist conditions. When cotton seedlings grown in contaminated soil and showing typical damping-off lesions were transplanted to a sterile site and allowed to reach maturity, 46 per cent. developed nub root symptoms compared with 4 per cent. of apparently healthy seedlings of the same lot. The [unspecified] fungi of the damping-off complex frequently did not penetrate beyond the endodermal layer, and in such cases there was no evident injury. It is postulated that nub root represents a transitional stage between this and extreme damping-off, the nature of the damage to the cambial tissue determining the direction and extent of its development.

Schmitz (G.). **Causes d'altération des graines de Coton.** [Causes of deterioration in Cotton seeds.]—*Bull. agric. Congo belge*, 45, 4, pp. 971–982, 2 col. pl., 1954. [Flemish summary.]

In experiments carried out at Bambesa, Belgian Congo, cotton seeds with a yellow discoloration were borne only on plants kept in cages in which individuals of *Dysdercus* had been placed; such seeds were non-viable. Brown or green to black seeds were affected by a secondary bacterial rot, which caused a complete, progressive rancidity of the oily substances in the endosperm. Unfavourable environmental conditions increased bacterial action. In 1949 caged plants had more seeds with bacterial rot than uncaged. In 1952–3 bacterial rot was very prevalent, maturation being impaired by the lack of rain in October. The resistance of the seed coats to common secondary micro-organisms was reduced, and multiplication of the invading organisms was later favoured by the humidity resulting from late rains. Various bacteria and bacilli were isolated from affected seeds, infection ranging from 0 to 45 per cent. for seed from different localities.

Hunter (R. E.) & Blank (L. M.). **Pathogenicity differences of Xanthomonas malvacearum isolates.**—Abs. in *Phytopathology*, 44, 6, p. 332, 1954.

In inoculation tests [in New Mexico] with *Xanthomonas malvacearum* [*R.A.M.*, 33, p. 216] during the winter of 1951–2, supposedly resistant cotton seedlings occasionally gave a susceptible reaction. For instance, two isolates, 51–1 and 53–1, consistently attacked resistant Acala seedlings. In a comparative field test in 1953, 96 rows of Acala breeding material with the Stoneville 20 type of resistance [33,

p. 481] were susceptible to isolate 53–1 and resistant to a composite inoculum of normal strains, while six rows of Acala 8373 were resistant and two of commercial 1517 C susceptible to both sources of infection. Blight-resistant Acala seedlings were likewise attacked by 18 additional isolates of *X. malvacearum* obtained from resistant cottons at four localities in New Mexico and Texas. The existence of this virulent strain of the pathogen presents a threat to a breeding programme based on the Stoneville 20 type of resistance.

Peach (Mary). **Aquatic predacious fungi. III.**—*Trans. Brit. mycol. Soc.*, 37, 3, pp. 240–247, 6 figs., 1954.

In a further study in this series [cf. *R.A.M.*, 29, p. 509] at the Polytechnic, Regent St., London, descriptions are given of the following predacious fungi newly recorded in Great Britain: *Stylopage rhabdospora* [cf. next abstract] and *Zoopage pachyblasta* preying on amoebae; *Arthrobotrys cladodes* var. *macroides*, *A. superba*, *Dactylaria brochopaga*, and *Acrostalagmus zeosporus* capturing eelworms; and *Dactylella spermatophaga* parasitic on the oospores of a species of *Pythium*.

Juniper (A. J.). **Some predacious fungi occurring in dung. II.**—*Trans. Brit. mycol. Soc.*, 37, 2, pp. 171–175, 3 figs., 1954.

Four predacious fungi occurring in dung in Great Britain are described [cf. *R.A.M.*, 33, p. 538]: *Acaulopage lophospora* [25, p. 342] and *Stylopage rhabdoides* [26, p. 545], which capture amoebae, are believed to be new records for Europe. *Protascus subuliformis* [26, p. 106] and *Arthrobotrys robusta* [31, p. 283] destroy nematodes.

Prowse (G. A.). **Sommerstorffia spinosa and Zoophagus insidians predacious on rotifers, and Rozellopsis inflata the endoparasite of Zoophagus.**—*Trans. Brit. mycol. Soc.*, 37, 2, pp. 134–150, 8 figs., 1954.

Studies at the Brown Trout Research Laboratory, Pitlochry, Perthshire, demonstrated that *Sommerstorffia spinosa*, a new record for Britain, captures the loricate rotifers [*R.A.M.*, 25, p. 475] *Distyla* and *Monostyla*. *Zoophagus insidians* [cf. 32, p. 214], more widespread than *S. spinosa*, captures *Distyla*, *Monostyla*, *Diplois*, and *Diplaxis*. It was eventually cultured for the first time, with great difficulty, on oatmeal agar. *Rozellopsis inflata* parasitized *Z. insidians* both in nature and in culture. *Pythium intermedium* and some unidentified *P.* spp. were also infected, but not *Phytophthora megasperma*.

Andrén (F.). **Försök med betning av Linfrö.** [Tests on the treatment of Linseed.]—*Växtskyddsnotiser, Stockh., 1954*, 2–3, p. 22, 1954.

In the summer of 1953 field tests were carried out in Sweden by the Plant Protection Institute on linseed flax treated with a number of different preparations [*R.A.M.*, 32, p. 578]. The seed was attacked by *Alternaria* [29, p. 249; 30, p. 360] and *Colletotrichum* [? *linicola*] but the plants which finally developed were completely disease-free. The best stands were obtained with the mercury-free products special-panogen (134·1 per cent. plants compared with 100 per cent. for plants from untreated seed), aatiram (133·9), and arasan (124·6) all at 400 gm. [? per 100 kg. seed], and panogen 4930 (122·5) at 200 gm.

Cumber (R. A.). **Search for alternative vectors of the yellow-leaf disease of Phormium.**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 1, pp. 32–37, 1954.

Tests at the Entomological Research Station, Foxton, New Zealand, with five insect species indicate that the yellow leaf disease of *Phormium tenax* [*R.A.M.*, 33, p. 604] is possibly transmitted by the mealybug *Trionymus diminutus*, which is common on *Phormium* throughout the Paiaka area. When 12-month-old seedlings from field beds were infested with mealybugs fed on diseased pot plants no typical

yellow leaf symptoms developed, but the sudden die-back [loc. cit.] was evident. No evidence was obtained of *Oliarius oppositus* transmitting the disease. The sudden die-back condition was more prevalent among experimental plants set up for periods over one year.

WAITE (B. H.). **Vascular disease of Abacá or Manila Hemp in Central America.**—*Plant Dis. Reptr*, 38, 8, pp. 575–578, 2 figs., 1954. [Multilithed.]

Abaca (*Musa textilis*) vascular disease (*Fusarium oxysporum* var. [f.] *cubense*) [*R.A.M.*, 33, p. 723] is reported to be a serious threat to the production of high-quality fibre in Central America (Panama, Costa Rica, Honduras, and Guatemala), where large-scale plantings are maintained. The disease was reported in Panama a few years after the first permanent plantings were made in 1925, but damage caused was not as important on abaca as on Gros Michel bananas [34, p. 43], which develop much more conspicuous symptoms. Proper selection and planting of resistant varieties are regarded as the best means of controlling the abaca disease. Nine promising clones, with varying degrees of resistance, have been selected from crosses between Tangongon, Bungalonon, and Sinaba and, despite their inadequacy in other respects, are recommended for experimental field plantings.

OCFEMIA (G. O.). **Note on the occurrence of the mosaic disease in the Abacá Experiment Station in Banao, Guinobatan, Albay.**—*Philipp. Agric.*, 37, 1–2, pp. 84–87, 2 figs., 1953. [Received September, 1954.]

In June, 1952, abaca (*Musa textilis*) plants showing symptoms of mosaic [*R.A.M.*, 32, pp. 481–482 and above, p. 138] were observed at the Abacá Experiment Station, Banao, Guinobatan, Albay, Philippines. There were rust-brown streaks on the leaves, a purplish tinge on the rest of the upper surface, and purplish-brown streaks on the adaxial side of the petioles and leaf sheaths, symptoms similar to those noted in transmission experiments at Los Baños. The affected plants were destroyed and in April, 1953, no new cases were observed. Mosaic is also present at Leyte and Sorsogon.

CRANDALL (B. S.). **Additions to the host and geographic range of Abutilon mosaic.** —*Plant Dis. Reptr*, 38, 8, p. 574, 1954. [Multilithed.]

Abutilon mosaic [Abutilon variegation] virus [*R.A.M.*, 32, p. 563] is recorded by the Cooperative Fiber Commission, Santiago de las Vegas, Cuba, on *Stizolobium* spp., *Mucuna pruriens* (transmitting the virus through its seeds), *Malvastrum coromandelianum*, *Hibiscus cannabinus*, cotton, and *Euphorbia hirta* from El Salvador and on *Rhynchosia minima*, *Sida acuta*, *E. heterophylla*, and *H. cannabinus* from Cuba.

PAPE (H.). **Krankheiten und Schädlinge der Zierpflanzen. Vierte, neubearbeitete und erweiterte Auflage.** [Diseases and pests of ornamental plants. Fourth, revised and amplified edition.]—viii+559 pp., 470 figs., 3 diags., 1 map, Berlin and Hamburg, Paul Parey, 1954. DM. 53.80.

The third edition of this important manual [cf. *R.A.M.*, 11, p. 245], which appeared in 1939, has been out of print for several years. Extensive revision and amplification of the contents in preparation for the present edition were necessitated by recent advances in scientific knowledge, particularly in the field of chemical plant protection, as well as by new observations and experience in practice. Sections on various genera of flowering plants are new features.

VLADIMIRSKAYA (Mme M. E.). Грибные болезни цветочных культур (летников). [Fungus diseases of flowering plants (summer).]—Бот. Журн. [*J. Bot. U.S.S.R.* = *Bot. Zh. S.S.S.R.*], 38, 6, pp. 817–829, 4 figs., 1953.

In 1951–2 a survey was made of diseases of ornamental plants in public parks,

squares, avenues, and gardens of Leningrad, U.S.S.R., and its suburbs. Of the diseases recorded the most serious were black mould (*Alternaria* sp.) on the seeds and black leg (*Moniliopsis aderholdi*) [cf. *R.A.M.*, 29, p. 619] on seedlings of *Antirrhinum majus* (up to 14 and 15 per cent. infection, respectively) and *Matthiola* (up to 28 and 80 per cent., respectively), and the former on phlox (14 per cent.); grey mould (*Botrytis cinerea*) on China aster (30 per cent.) [cf. 32, p. 412] and phlox (14 per cent.); and *Fusarium* sp., which killed 80 to 90 per cent. of the former plants and infected up to 8 per cent. of their seeds, and *Verticillium albo-atrum* [cf. 29, p. 619] (up to 40 per cent. mortality on asters).

Gerlach (W.). **Untersuchungen über die Welkekrankheit des Alpenveilchens (Erreger : Fusarium oxysporum Schl. f. cyclaminis n.f.).** [Studies on the wilt disease of Cyclamen (causal organism: *Fusarium oxysporum* Schl. f. *cyclaminis* n.f.).]—*Phytopath. Z.*, 22, 2, pp. 125–175, 21 figs., 4 graphs, 1954.

A comprehensive survey is given of the author's studies on a wilt disease of *Cyclamen persicum* [see next abstract], which was first observed in Berlin market-gardens about 1930 and has been causing increasingly heavy losses (up to DM. 200,000 in epiphytotic seasons) since 1945. In the summer of 1953 a further focus of infection was detected in the Palatinate, but there are no reliable records to date of the occurrence of the disease outside Germany. Formerly attributed to *Fusarium oxysporum* var. *aurantiacum* [*R.A.M.*, 32, p. 191], the wilt is now referred to *F. o.* f. *cyclaminis* n.f. The minimum, optimum, and maximum temperatures for growth are 6°, 28°, and 35° C., respectively, and the corresponding pH levels 2, 6·6 to 8·5, and above 11·2. All the 19 monospore isolates from the discoloured corm vessels were highly pathogenic in inoculation experiments, which were best performed with material from cultures on a mixture of peat mould, chopped straw, sand, and water in 500-ml. flasks. Infection proceeds almost without exception from contaminated soil and involves the roots, corms, and aerial organs. The sporodochia commonly occurring on withered leaves are the principal sources of infection in the nursery. The growth of the fungus in the discoloured portions of the host is predominantly intra- but occasionally intercellular. Spread from one nursery to another is primarily by means of soil, plants, and pots, transmission through the seed being considered unlikely.

In Petri dish assays on beer wort agar with the addition of fungicides, mercury seed steeps 1 and 2 (at 0·001 per cent. mercury) completely suppressed the pathogen. Field tests have not yet been carried out. Soil sterilization by steaming for one hour reduced the losses from between 70 and 85 to from 7 to 17 per cent., and in one experiment equally good results were obtained with chloropicrin. Control has also been achieved by strict attention to sanitary practices, including renewal of the soil, decontamination of pots and houses, and eradication of diseased plants at the first sign of infection.

F. o. f. *cyclaminis* appears to be narrowly specialized on *C. persicum*, negative results having been given by inoculation tests on other *C.* and *Primula* spp. No indications of resistance were observed among 15,000 cultivated and 400 wild types of *C. persicum*.

Gerlach (W.). **Krankheiten und Schädlinge der Alpenveilchen.** [Diseases and pests of Cyclamens.]—*Flugbl. biol. Reichsanst., Berl.*, N 1, 8 pp., 5 figs., 1954.

Information is presented in popular terms on diseases of cyclamens in Germany, including damping-off (*Pythium debaryanum*, *Rhizoctonia* [*Corticium*] *solani*, and other organisms), brown root rot (*Thielavia* [*Thielaviopsis*] *basicola* [*R.A.M.*, 16, p. 465], wilt (*Fusarium oxysporum* [f. *cyclaminis*: see preceding abstract]), grey mould (*Botrytis cinerea*), and mildew (*Oidium cyclaminis*). The last-named is a recent record for Germany, though already known for some years in Austria and Holland.

Pettersson (S.). **Bladmögel på Lejongap.** [Leaf mould on Snapdragon.]—*Växtskyddsnotiser, Stockh., 1954*, 2–3, pp. 27–29, 1954.

A severe outbreak of *Peronospora antirrhini* occurred in the spring of 1954 on the municipal antirrhinum plantings in Stockholm [*R.A.M.*, 25, p. 454]; none of various fungicides used following the outbreak proved fully effective, but plants, both treated and untreated, taken into a hothouse for observation quickly recovered from the attack.

Paton (Mavis R.). **Petal blight of Rhododendron in Scotland.**—*Plant Path.*, 3, 2, p. 50, 1 pl., 1954.

Ovulinia azaleae [*R.A.M.*, 30, pp. 41, 52] is well established in several localities along the Solway coast of Scotland from New Abbey to Stranraer. In September, 1953, it was found on early-flowering rhododendron and azalea hybrids at Dunkeld, Perthshire, and recently on the late-flowering *Rhododendron discolor*.

In the late spring the sclerotium produces an apothecium and the ascospores infect the opening flowers. Weather conditions prevalent at this period determine the severity of attack; if they favour the production of conidia, the disease spreads rapidly, but if dry weather prevails, few conidia are produced and the outbreak remains localized. As far as is known, the fungus remains confined to the corolla tissue.

Hildebrand (E. M.). **Jasmine gall produced by a new species of Phoma.**—*Plant Dis. Reptr*, 38, 8, pp. 564–565, 4 figs., 1954. [Multilithed.]

Galls caused by a species of *Phoma* were observed on winter jasmine stems [*R.A.M.*, 16, p. 41] at Arlington, Texas, in 1949 and again later in Central Texas. Similar infection was readily induced on wounded winter and small-leaved jasmine and large-leaved privet by spray inoculation with spores from old galls. Specimens and information on the occurrence of galls on these and other ornamentals in other areas of the United States are requested (by the Plant Doctor Service, 4810 Winfree Drive, Houston 21).

Hildebrand (E. M.). **Camellia variegation in Texas.**—*Plant Dis. Reptr*, 38, 8, pp. 566–567, 1954. [Multilithed.]

During a survey carried out in 1952–4, of the diseases of ornamental plants in the Houston area of Texas, unsuitable soil and unsatisfactory drainage and irrigation were found to be mainly responsible for the high death-rate of camellias. Variegation, much of which is believed to be due to virus infection [*R.A.M.*, 33, p. 538], is next in importance.

Gould (C. J.) & McLean (D.). **Soil treatment for the control of fungi.**—Proceedings of the Bulb Growers' Short Course, Tacoma, Washington, March 4–5, 1954, pp. 24–26, 1954.

Field tests were carried out at Mt. Vernon, Washington, for the control of the soil-borne bulb diseases crown rot (*Sclerotium delphinii*) [*R.A.M.*, 33, p. 259] and black rot (caused by an unidentified black sclerotial fungus) [on bulbous iris, variety Wedgwood]. The most promising yield increases and disease control were given by PCNB (20 per cent. pentachloronitrobenzene) at 200 lb. per acre, applied a month before planting. The cost of this material, $200 per acre, is the chief drawback to its general use, and trials with smaller quantities are in progress.

Zaitlin (M.), Schlechtman (A. M.), Bald (J. G.), & Wildman (S. G.). **Detection of virus in Cattleya Orchids by serological methods.**—*Phytopathology*, 44, 6, pp. 314–318, 1 diag., 1 graph, 1954.

At the Departments of Botany, Zoology, and Plant Pathology, University of California, Los Angeles, after purification by differential centrifugation, virus from *Cattleya* orchid plants with symptoms of the flower-breaking disease [*R.A.M.*, 31,

p. 490; 33, p. 605] was used as antigen to induce the formation of anti-virus antibodies in rabbits. Tests with the antisera were then made on leaf-tip extracts of other orchid plants. By this means virus was detected in symptomless as well as visibly affected plants.

Electrophoretic analysis and electron microscopy revealed the association of two proteins with the flower-breaking disease of *Cattleya*.

Austwick (P. K. C.). **Mastigosporium deschampsiae Jørstad in Great Britain.**—*Trans. Brit. mycol. Soc.*, 37, 2, pp. 161–165, 2 figs., 1954.

An account is given of the symptoms, occurrence, seasonal variation, and cultural characteristics of *Mastigosporium deschampsiae* [*R.A.M.*, 26, p. 514], reported for the first time in Great Britain, causing leaf spot of *Deschampsia caespitosa* at Wicken Fen, Cambridgeshire. Development of the fungus is favoured by high humidity and low temperatures. *Alopecurus pratensis* and *Dactylis glomerata* were not affected in inoculation experiments. *M. deschampsiae* was found to be distinct from the fungus on collections of the same host made by Libert between 1830 and 1837 in Belgium; these bear true *M. album* [30, p. 473 and next abstract].

Ross (J. P.). **Mastigosporium album Riess on Alopecurus pratensis in New York.**—*Plant Dis. Reptr*, 38, 8, pp. 607–608, 1954. [Multilithed.]

Mastigosporium album [see preceding abstract] was observed on *Alopecurus pratensis* [*R.A.M.*, 32, p. 385; 33, p. 138] in June, 1954, near Ithaca, New York. This appears to be the first record of the fungus in the United States.

Ray (W. W.). **Unusual or new occurrences of fungus pathogens on grasses in Nebraska.**—*Plant Dis. Reptr*, 38, 8, pp. 583–587, 1954. [Multilithed.]

The following fungi were among those identified during a survey of the fungus flora of grasses [cf. *R.A.M.*, 30, pp. 420, 481] in Nebraska: *Claviceps purpurea* [C.M.I. map No. 10] on *Andropogon hallii*, *A. gerardi*, and *Hordeum jubatum*; *Colletotrichum graminicola* [*R.A.M.*, 29, p. 609; 33, p. 102] on *A. gerardi*, *Agropyron smithii*, *A. trachycaulum*, *Panicum scribnerianum*, *P. virgatum*, *Calomovilfa longifolia*, *Muehlenbergia racemosa*, *Poa pratensis*, and *Sorgastrum nutans*; and *Piricularia grisea* [cf. 33, p. 338] on *Setaria lutescens* and *Digitaria sanguinalis*.

Garren (K. H.). **Disease development and seasonal succession of pathogens of White Clover. Part I—leaf diseases.**—*Plant Dis. Reptr*, 38, 8, pp. 579–582, 3 diags., 1954. [Multilithed.]

The ecology of fungal pathogens of white clover is being investigated by the Department of Botany and Plant Pathology, Alabama Polytechnic Institute, Auburn, to determine why the plant fails to persist as a perennial in Alabama. Data, taken at monthly intervals, starting in March, 1953, were obtained by isolating fungi from diseased tissue selected at random, each fungus being identified and expressed as a percentage of the total isolations made on any given date, or by evaluating leaf disease damage from visual estimates of blade damage combined with percentage of leaves lost, less defoliation due to stolon diseases. There were three successional groups of pathogenic fungi. *Colletotrichum destructivum* [*R.A.M.*, 33, p. 637] and a non-sporulating fungus, probably a species of *Stemphylium*, occurred throughout the year with peak development in the spring and early summer, and caused the greatest damage; they were followed closely by 'debility', due to factors other than fungi, which was most severe in the winter. *Pseudoplea trifolii*, *Stagonospora meliloti* [33, p. 730], and *Sclerotinia trifoliorum* [33, p. 676], occurring chiefly at low temperatures, were less important, and *Curvularia trifolii* [cf. 30, p. 470] and *Colletotrichum graminicola* [33, p. 637], present at high temperatures, were negligible.

Kilpatrick (R. A.), Hanson (E. W.), & Dickson (J. G.). **Relative pathogenicity of fungi associated with root rots of Red Clover in Wisconsin.**—*Phytopathology*, 44, 6, pp. 292–297, 3 figs., 1954.

Continuing their studies on red clover root rots in Wisconsin [*R.A.M.*, 34, p. 39], the authors found that many of the fungi concerned are also pathogenic to the crop in the seedling stage, the most virulent being three isolates of *Pythium debaryanum*, one strain each of *P.* sp., *Fusarium oxysporum*, *F. solani*, and *F.* '*roseum*', and the one isolate of the black patch fungus [31, p. 18] tested. Moderate damage was caused by some isolates of *Rhizoctonia*, *Phoma*, and *Gliocladium roseum*.

Pathogenicity was evaluated in the laboratory by a modification of Neergaard's technique [25, p. 579], in which the seedlings were grown in combination with the fungi for ten days on filter paper platforms dipping into sterile distilled water in test-tubes. This procedure was specially useful for rapid preliminary tests, requiring minimum equipment and space, but it did not measure pre-emergence effects. The glass tumbler method described by Halpin *et al.* [31, p. 386], by which both pre- and post-emergence effects can be determined, was used in the greenhouse. Both methods yielded consistent results in repeated tests.

Lesins (K.). **Susceptibility of some diploid Alfalfas to bacterial wilt.**—*Agron. J.*, 46, 6, pp. 251–252, 1954.

In experiments at Edmonton, Alberta, Canada, to determine the relative susceptibility to bacterial wilt [*Corynebacterium insidiosum*: *R.A.M.*, 33, p. 589] of eight diploid strains of lucerne, significant differences were observed between the standard variety Grimm and *Medicago falcata* from the north-west Caucasus and *M. sativa* from Armenia. Thus, the percentages of top and root symptoms on 18th April, 1953, in *M. falcata* were 16 and 36, in *M. sativa* 33 and 40, and in Grimm 88 and 84, respectively. Coming from one of the wettest regions of the U.S.S.R., the Caucasian strain of *M. falcata* may well be of interest in breeding projects for humid areas.

M. falcata from Alaska, apparently the only strain able to grow on permanently frozen subsoil, would probably be an important parent in hybridization for the development of varieties adapted to regions north of the present lucerne-growing boundaries, but it is highly susceptible to wilt (75 and 92 per cent. top and root symptoms, respectively), so that a search for resistant plants should be made at an early stage of the breeding programme.

The top and root symptom percentages of the remaining strains were as follows: *M. hemicycla* from Transcaucasia, 37 and 73; *M. sativa* var. *parviflora* from Georgia, U.S.S.R., 60 and 87; a drought-resistant form of *M. sativa* from a semi-desert habitat in the U.S.S.R., 55 and 75; *M. sativa* from Kashan, Persia, 90 and 95; and *M. falcata* from south Germany, 68 and 88.

Diploids of *M. falcata* are stated to have been largely incorporated into the Rhizoma [32, p. 66] and Narragansett lucerne varieties.

Miller (J. H.). **Studies in the Phyllachoraceae. II. Phyllachora lespedezae.**—*Amer. J. Bot.*, 41, 10, pp. 825–828, 13 figs., 1954.

Studies in the Department of Plant Pathology, University of Georgia, Athens, revealed that *Phyllachora lespedezae* attacking *Lespedeza* spp. is unusual in that it forms two kinds of ascocarps. The first, lasting for two to three weeks in early summer, consists of single, non-stromatic, highly fertile perithecia originating from ascospores from overwintered perithecia on dead, fallen leaves. It is succeeded by secondary ascospore infections which develop into large, flat, mostly sterile stromata. In a few of these perithecial initials and young perithecia form during the summer; they mature the following spring. The characters of the first crop of perithecia are well within the concept of the genus *Phyllachora*. Those of the

perithecial centra of the two types are identical. The stroma appears to be new to the generic concept. Accordingly, the diagnosis needs to be emended, but not until more tropical species have been studied.

Salam (M. H.) & Rao (P. N.). **A new species of Trichoconis on Crotalaria verrucosa from Hyderabad—DN.**—*J. Indian bot. Soc.*, 33, 3, pp. 189–191, 2 figs., 1954.

Shrivelled and discoloured leaves and pods of *Crotalaria verrucosa* collected near the Agricultural College Farm, Osmania University, Hyderabad, India, were found to be infected by *Trichoconis crotalariae* n.sp. It caused white mouldy patches on leaves, flowers, and mature pods. The conidia are 5 to 8 septate and measure 46·8 to 95 by 10·4 to 18·2 μ, with a slightly curved, hyaline, non-septate appendage 49·4 to 127·5 μ long. After seven to ten days in culture regular zones of sclerotia are formed; these are cylindrical or irregular, black, and covered with stiff bristles 0·5 to 3 by 0·25 to 0·5 mm.

Singh (R. S.). **Effect of mixed cropping on the incidence of root-rot, wilt and associated diseases of Cyamopsis psoraloides.**—*Agra Univ. J. Res.*, 3, 2, pp. 359–373, 2 diags., 1954.

At the Government Agricultural College, Kanpur, Uttar Pradesh, field experiments to ascertain the effects of mixed sowings and intercropping on the incidence of root rot (*Rhizoctonia* [*Corticium*] *solani*) and wilt (*Fusarium caeruleum*) of guar (*Cyamopsis psoraloides*) [*R.A.M.*, 33, p. 517 and next abstract] were carried out from 1949 to 1951.

When guar was grown on heavily infested land with sorghum, cowpea, and *Phaseolus aconitifolius*, in various combinations, the incidence of *Corticium solani* and *F. caeruleum* (measured as a percentage of the total mortality from the seedling stage to mature plant) was considerably decreased. The best results from mixed crops in the three years were with guar, sorghum, and *P. aconitifolius* together (14, 15·2, and 8·3 per cent. compared with 55·9, 60·7, and 49·6 per cent. for pure guar). From experiments with plants and rows different distances apart it is concluded that the reduction in root rot and wilt is due to the barriers formed by non-susceptible roots between diseased and healthy *Cyamopsis*, and spacing which reduces contact between host and parasite. The highest yields of fodder were obtained with the mixture guar, cowpea, sorghum, and *P. aconitifolius* (298·8 maunds [1 maund = 82 lb.]), the mixture guar, cowpea, and *P. aconitifolius* being second (270).

Singh (R. S.). **Root-rot and wilt of Cyamopsis psoraloides in relation to date of sowing.**—*Agra Univ. J. Res.*, 3, 2, pp. 375–383, 1 diag., 2 graphs, 1954.

In further field investigations of *Rhizoctonia* [*Corticium*] *solani* and *Fusarium caeruleum* on *Cyamopsis psoraloides* [see preceding abstract], carried out at Kanpur, Uttar Pradesh, from 1949 to 1951, it was shown that mortality due to these diseases was considerably affected by the date of sowing. In all three years incidence was lowest when *C. psoraloides* was sown in the first two weeks of May, mortality being 15, 9·7, and 13·4 per cent. in 1949, 1950, and 1951, respectively, rising to maxima of 44·7, 40, and 37·1 per cent. at the end of July. The advantage of early sowing holds only for irrigated areas.

Betydningen af sprøjtetidspunkternes beliggenhed i forhold til infektionsperioderne ved bekaempelse af Aebleskurv. [The significance of the sequence of spraying dates in relation to infection periods in Apple scab control.]—*Medd. Forsøgsv. Plantek. Kbh.* 515, 4 pp., 1954.

Experiments were carried out in Denmark during 1952 and 1953 to compare the relative efficiency of three spraying schedules for the control of apple scab [*Venturia*

inaequalis: *R.A.M.*, 24, p. 425 *et passim*], namely, (A) the standard, based on the several stages of development of the trees, (B) at the beginning of ascospore discharge and thereafter at regular ten-day intervals, and (C) at the inception of ascospore discharge and after every period of rainfall. The Signe Tillisch and Graasten varieties were used in both years, with the addition in 1953 of James Grieve and Golden Delicious. In 1952 Bordeaux mixture 2–1–100 was used for the first (A) treatment, 0·75 per cent. thiovit for the second, and the same at 0·5 per cent. for the remainder. In (B) and (C) thiovit was applied at 0·75 per cent. before blossom and at 0·5 per cent. after. In 1953 Bordeaux mixture was used at 1 per cent. for the first A schedule spray with an extra treatment with 0·5 per cent. thiovit interpolated at the green-cluster stage; for all the post-blossom applications 0·4 per cent. thiovit was used. Midol special merkuri (1 per cent.) was also tested by all schedules on all the varieties except James Grieve.

In both years the average incidence of infection was highest in (A) and lowest in (C). For instance, the average percentages of leaf and fruit scab on Signe Tillisch and Graasten treated according to (C) in 1952 were 1 and 10, respectively, compared with 18 and 22 for A, 16 and 15 for B, and 48 and 94 for the unsprayed. In 1953 the same varieties treated with thiovit by the (C) plan contracted 14 and 6 per cent. leaf and fruit scab, respectively, the figures for midol being 29 and 28 and for the untreated 68 and 100. For James Grieve the percentages of leaf and fruit scab in (C) plots were 17 and 4, respectively, compared with 54 and 6 in (A), 43 and 6 in (B), and 100 and 85 in the untreated. The corresponding percentages for Golden Delicious (C) were: thiovit 41 and 11, and midol 47 and 8, respectively. In the A plots of Golden Delicious treated with Bordeaux mixture and thiovit the incidence of leaf and fruit infection was 60 and 37 per cent., respectively, in those where thiovit alone was used 82 and 52, and in the Bordeaux-midol-treated 67 and 27. For plan B the percentages of leaf and fruit scab were 54 and 41 for thiovit and 59 and 38 for midol.

Wilkinson (E. H.). **Fungal rots of Apples with special reference to Gloeosporium spp.**—*Ann. appl. Biol.*, 41, 2, pp. 354–358, 1954.

After briefly reviewing the results obtained in the study of the fungal rots of apples held in cold storage at Long Ashton, Bristol, during the storage period 1937–9 [*R.A.M.*, 18, p. 743; 23, p. 444] the author states that the heavy losses sustained in Kent during the past three or four years have confirmed the finding that the most important causes of the rotting are *Gloeosporium album* [33, p. 540] and *G.* [*Neofabraea*] *perennans* [24, p. 422]. Whereas, however, in 1937–9 *G. album* was the principal cause of lenticel rotting, to-day *N. perennans* is the dominant species. The apparent increase in the prevalence of lenticel rotting may be due to: (*a*) an unexplained increase in the orchard distribution and prevalence of both fungi; (*b*) the rapid increase in the quantity of apples stored; (*c*) the longer storage periods now made possible; (*d*) the tendency to use more liberal applications of nitrogenous fertilizers; or to all these factors together. Detailed study is required of the orchard ecology of *G. album* and *N. perennans* and of the mode of transference of spores from branch lesions to the fruit, as well as of the factors which may predispose stored fruits to attack by organisms causing lenticel rotting.

Byrde (R. J. W.). **Experiments on the control of brown rot of Apples and Plums. IV. A supplementary note on winter spraying.**—*J. hort. Sci.*, 29, 3, pp. 226–230, 1954.

In further spraying tests at the Long Ashton Research Station, University of Bristol [*R.A.M.*, 32, p. 568], the addition of 0·7 per cent. pentachlorophenol to the winter application (February, 1952 and 1953) of 3·5 per cent. tar oil emulsion to Laxton's Superb apples (5 gal. per tree) was followed by a significant reduction in the sporulation of mummified apples in July, 1952, and the infection of fruit

wounds by brown rot (*Sclerotinia fructigena*) [33, p. 90] during August. Later however, the rapid build-up of infection offset the effects of the treatment.

D'Yakonova (Mme E. D.). Опыт химической борьбы с черным раком Яблони. [Tests on the chemical control of Apple black rot.]—Сад и Огород [*Orchard & Garden*], *1954*, 8, pp. 76–77, 1954.

In experiments in the U.S.S.R., painting the affected parts of apple trees with copper naphthenate in kerosene gave the best control of black rot [*Physalospora obtusa*: *R.A.M.*, 17, p. 688; cf. 33, p. 90], followed by 2 per cent. clay suspension in kerosene. Varieties with slight (Korichnoe, Borovinka, Saffron Pippin, Papirovka, and Grushovka), medium (Slavyanka, Babushkino, and Osenee polosatoe), and high susceptibility are listed.

Padfield (C. A. S.) & Woon (P.). **Calyx-end breakdown : an unusual form of breakdown in Sturmer Pippin Apples.**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 1, pp. 75–77, 2 figs., 1954.

A new form of apple breakdown, for which the name calyx-end breakdown is proposed, has been observed in New Zealand in Sturmer Pippin apples since 1925 [*R.A.M.*, 5, p. 562]. It caused serious losses in Hawkes Bay and Nelson in 1947 and 1953. The cause of the disorder is unknown and there is no known control. When the fruit is still hard and green the flesh near the calyx has a sharply delimited chocolate-brown colour and develops numerous cavities. The disorder differs from all other breakdowns already described, though it closely resembles crinkle [26, p. 495], differing in that no external distortion round the calyx is visible. Lowering storage temperature, while reducing the development of the disorder, is not recommended as it would result in serious losses from internal breakdown [33, p. 91]. Calyx-end breakdown was more severe in the later picked fruit from all affected orchards, and may develop when the fruit is left to ripen on the tree.

Dullum (N.) & Rasmussen (P. M.). **Forsøg med opbevaring af Paerer 1939–1952.** [Experiments on the storage of Pears 1939 to 1952.]—*Tidsskr. Planteavl*, 58, 1, pp. 91–148, 20 graphs, 1954. [English summary.]

In the series of experiments in Denmark [cf. *R.A.M.*, 31, p. 66] herein fully described and tabulated, very few pear varieties could be kept for any length of time in an ordinary ventilated store with an average temperature of 10° C. in October, when most of the fruit is harvested. Thus, the limit for Joséphine de Malines and Soldat Laboureur was about two months and for Doyenné du Comice and Fondante de Charneu one month. All the other varieties deteriorated in 10 to 12 days, mostly from over-ripening, though [unspecified] fungal rots were also fairly prevalent. In a cold store at 3°, and more especially at 1°, the fruit remained in good condition for considerably longer periods, the principal limiting factor being internal breakdown. Joséphine de Malines kept for four to five months at both temperatures and Soldat Laboureur for 4 to 4½ and 5 to 5½ at 3° and 1°, respectively. At 1° Conference was still sound after six months, Doyenné du Comice and Herrepaere after four to five, Fondante de Charneu after four, and Nouveau Poiteau after 4 to 4½. Gas storage at 5° with 6 or 9 per cent. carbon dioxide [cf. 34, p. 41] was not generally successful, but Conference kept for six months and Joséphine de Malines for five to six under these conditions, which may also prove to be suitable for some of the other varieties on further testing.

Dye (D. W.) & Dye (M. H.). **Effectiveness of therapeutants including antibiotics in preventing development of blast in stone fruit (Pseudomonas syringae van Hall).**—*N.Z. J. Sci. Tech.*, Sect. A, 36, 1, pp. 21–26, 1954.

Tested on vigorously growing glasshouse seedling peach trees at the Plant

Diseases Division, Auckland, New Zealand, streptomycin sulphate (1000 to 50 μgm. per ml.) and dihydrostreptomycin (1000 to 100) sprayed on to the pricked stems were most effective of all the therapeutants tested against subsequent infection by *Pseudomonas syringae* [*R.A.M.*, 33, p. 736 and next abstract] applied as a broth suspension. At a concentration of 100 μgm. per ml. lesions developed at 18·3 per cent. of the inoculation points compared with 88·3 per cent. on plants not sprayed with the antibiotic. Aureomycin, terramycin, and chloramphenicol, though significantly reducing the number of lesions, were not quite as effective. Chloramphenicol, polymyxin, thiolutin, Bordeaux mixture, copper 8-quinolinolate, and murfixtan were phytotoxic at some concentrations.

Dye (M. H.). **In vitro studies of the effect of antibiotics on Pseudomonas syringae.** —*N.Z. J. Sci. Tech.*, Sect. A, 36, 1, pp. 27–31, 1 graph, 1954.

In *in vitro* studies at the Plant Diseases Division, Auckland, New Zealand, of the seven antibiotics tested against *Pseudomonas syringae*, the cause of peach seedling blast [see preceding abstract], aureomycin (the most effective), streptomycin, dihydrostreptomycin, terramycin, and polymyxin all inhibited the growth of the bacterium in Difco nutrient broth plus 0·5 per cent. glucose within the range 0.1 to 4·6 μgm. per ml. after 24 hours' incubation at 28° C. When 10 μgm. per ml. of streptomycin sulphate was added to broth cultures containing $2{\cdot}05 \times 10^6$ bacteria, no viable *P. syringae* could be detected after 24 hours' incubation, while live bacteria were present at 5 μgm. per ml. of streptomycin after 24 but not after 48 hours' incubation. An initial reduction in the number of viable bacteria followed by a rise in count was noticed at lower concentrations of streptomycin.

Benlloch (M.). **La enfermedad del 'cribado' en el Cerezo.** [Shot-hole disease in the Cherry tree.]—*Agricultura, Madr.*, 23, 265, pp. 252–255, 6 figs., 1954.

Frequent rainfall and low temperatures during spring, 1954, gave rise to unwontedly severe outbreaks of shot-hole (*Clasterosporium carpophilum*) [C.M.I. map No. 188] on stone fruits in Spain, particularly in the cherry-growing areas of Cabezuela, Navaconcejo, and Jerte in Cáceres province and on apricots. The severity of the damage was due to the lack of treatment or inefficient application. The author recapitulates the symptoms, cause, development, and control of the disease.

In areas where shot-hole is endemic Bordeaux mixture sprays should commence at bud-burst, the second being applied at petal-fall, and a third ten to 15 days later. Otherwise only the first spray need be given as a protective measure when the spring is wet, provided that the trees are watched carefully for any disease development. It is important to ensure that the fungicide is delivered in a fine spray to obtain the best coverage and adhesion to all parts of the tree.

Kulikov (V. A.). Формирование клейстокарпий у гриба **Sphaerotheca mors-uvae** в зависимости от температуры и влажности воздуха. [Formation of cleistocarps by the fungus *Sphaerotheca mors-uvae* in relation to temperature and air humidity.]—Микробиология [*Microbiology, Moscow*], 22, 2, pp. 194–197, 2 figs., 1953.

Studies conducted at the Fruit and Viticultural Experiment Station, Saratov, U.S.S.R., from 1946 to 1948, inclusive, showed that if the cleistocarps of *Sphaerotheca mors-uvae* [*R.A.M.*, 33, p. 162; 34, p. 97] on gooseberry are immature (no spores formed) when the hot, dry weather occurs (above 30° [C.]), they die off. For maturation continuous conditions of moderate temperature and favourable humidity are required.

Vologdina (Mme F. G.). Меры борьбы с антракнозом Смородины и Крыжовника. [Control measures against Currant and Gooseberry anthracnose.]—Сади Огород [*Orchard & Garden*], *1954*, 7, pp. 79–80, 1954.

Anthracnose [*Pseudopeziza ribis*: *R.A.M.*, 33, p. 736] reduces the growth of gooseberry and currant (red, black, and white) bushes by 35 per cent. and yields by 50 per cent. in the U.S.S.R. At the Moscow Berry Fruit Station 0·5 per cent. colloidal sulphur gave the highest percentage of healthy leaves on currants, i.e., 69 in 1950, 76 in 1951, and 98 in 1952, the corresponding figures for 1 per cent. Bordeaux mixture being 47, 73·2, and 94·5, and for the untreated 16·7, 33·2, and 60. Preparation No. 6 (1 per cent.) was the most effective on gooseberries, the percentages of healthy leaves for the three years, respectively, being 90·3, 89·2, and 90, as against 80·1, 82·6, and 83 for Bordeaux mixture and 70, 71·2, and 70 for the untreated.

Miller (P. W.). **Indexing Strawberries infected with non-persistent viruses by use of detached leaves and aphids.**—*Plant Dis. Reptr*, 38, 8, pp. 568–571, 1954. [Multilithed.]

A technique for detecting non-persistent strawberry viruses [*R.A.M.*, 33, p. 435 and next abstract] in samples with a high incidence was developed by the Horticultural Crops Research Branch, Corvallis, Oregon. Ten to 15 virus-free aphids (*Pentatrichopus fragaefolii*) are placed on the lower surface of young, detached leaves from the plant to be indexed and the leaves are left on moistened filter paper in a covered dish; 48 hours later the aphids are transferred to healthy *Fragaria vesca* (East Malling strain) indicator plants where they are allowed to feed for 72 hours. Symptoms develop 10 to 15 days later. The method can be used at any time with growing leaves on the plant irrespective of the presence or absence of stolons, and is most valuable in the preliminary screening of a large plant population. It is not suitable for certifying plants as virus-free since persistent viruses are not detected.

Marcus (C. P.) & Darrow (G. M.). **Intergrafting virus-free plants of eight Strawberry varieties produced no virus symptoms.** *Plant Dis. Reptr*, 38, 8, p. 607, 1954. [Multilithed.]

No virus symptoms were transmitted when apparently virus-free plants of the strawberry varieties Klondike, Dunlap, Howard 17 (Premier), Marshall, Aroma, Blakemore, Catskill, and Massey, grown in most regions of the United States [cf. *R.A.M.*, 32, p. 683; 33, p. 737], were intergrafted in groups of two, four, and eight varieties and the various combinations were grafted to *Fragaria vesca* (East Malling strain) [see preceding abstract]. It is concluded that these stocks carry no viruses that singly or together produce symptoms on the indicator and that they can be grown in adjacent rows or fields without any harmful effect of one variety on another, even when aphid vectors are numerous.

Cognée (M.) & Mouton (A.). **Développement de trois isolements de Gloeosporium musarum Cke et Massee.** [The development of three isolates of *Gloeosporium musarum* Cke & Massee.]– *Rev. Mycol.*, 18, *Suppl. colon.* 2, pp. 103–110, 4 figs., 1953. [Received September, 1954.]

In a cultural study of three isolates of *Gloeosporium musarum* obtained from the surface of a rotting banana fruit [cf. *R.A.M.*, 32, p. 634] six types of reproductive structures developed on various agar media. They were (*a*) typical sclerotia; (*b*) sclerotium-like structures containing an eccentrically placed, spherical 'nucleus' 25 to 40 μ in diameter, made up of cells with deeply staining protoplasm; (*c*) similar structures, but with an eccentric, hemispherical cavity filled with a mass of more or less shapeless young spores borne on distinct conidiophores; (*d*) typical pseudo-

pycnidia lined with parallel conidiophores, the spores being released by rupture of the wall; (*e*) acervuli; and (*f*) isolated, branched, hyaline conidiophores, developing on media very rich in sugar.

The possible developmental connexion between these forms is discussed.

Reckendorfer (P.). **Theorie und Praxis der durch Pflanzenschutzmittel verursachten Pflanzenschäden. Mikrochemie der Verbrennungserscheinungen.** [Theory and practice of plant damage caused by plant protectives. Microchemistry of scorch phenomena.]—*PflSchBer.*, 13, 9–10, pp. 129–153, 1954. [English summary.]

In a series of experiments carried out at the Plant Protection Institute, Vienna, Austria, the author investigated the effect of the metallic ions in plant protectives on the chlorophyll molecule. He describes in detail his method for the microdetermination visually and quantitatively, of the zinc content in plants.

Yeager (C.). **Improvement in fungicides through formulations.**—*Canad. Chem. Metall.*, 38, 7, pp. 58–59, 1954.

Recent important developments in the enhancement of fungicidal efficiency through correct formulation, with special reference to copper-8-quinolinolate [*R.A.M.*, 34, p. 47], are reviewed in the light of 13 contributions to the literature.

Hammarlund (L.). **Afprøvning af plantebeskyttelsesmidler 1953.** [Evaluation of plant protectives 1953.]—*Tidsskr. Planteavl*, 57, 3, pp. 539–552, 1954. [English summary.]

This report from the Danish State Experimental and Research Station for Plant Diseases and Pests covers mainly the years 1952 and 1953 but includes the results of a few earlier tests. Of the fungicides assayed for the control of seed-borne diseases of cereals [cf. above, p. 140], aagrano was the most effective against stripe disease of barley [*Helminthosporium gramineum*] and loose smut of oats [*Ustilago avenae*], while a mercury-free brand of tillantin, containing arsenic, from Bayer, Leverkusen, reduced wheat bunt [*Tilletia caries* and *T. foetida*] and flag smut of rye [*Urocystis occulta*] to a minimum (class 1). It also gave the highest increase of wheat yield in small-scale tests with five of the seed-dressings. There was no advantage in the use of a double quantity (200 as against 100 gm. per 100 kg.).

In plots sprayed against potato blight [*Phytophthora infestans*] with Bordeaux mixture at a rate corresponding to about 3½ kg. copper per ha., copper oxychloride 3½, copper oxide 2½ to 3½, and zineb 2½, the tuber yields (average for the two years) were 323, 327, 325, and 312 hkg. per ha., respectively.

Of the 50 preparations tested against apple scab [*Venturia inaequalis*] on seven different varieties, the best from the standpoint of fruit scab control were 0·25 per cent. esso 406 (a brand of captan) and various copper-containing fungicides, used for the earlier treatments (up to green cluster) only, followed by thiram, ziram, and ferbam. Thiram was the least and copper the most phytotoxic, while captan, ferbam, and ziram were intermediate in this respect.

Miller (P. M.) & Linn (M. B.). **The efficacy of fungicides in the control of certain genera of plant pathogenic fungi: a literature review.**—*Plant Dis. Reptr, Suppl.* 226, pp. 54–71, 1954. [Multilithed.]

An evaluation, based on data obtained from the literature (68 titles) over the period 1942–52, is made of the comparative effectiveness of 17 types (33 formulations) of fungicides against 23 plant-pathogenic species of *Alternaria*, *Cercospora*, *Colletotrichum*, and *Septoria*. A formula was developed for calculating the control-index for each fungicide, using zineb, ziram, fixed copper, and Bordeaux mixture as standards. Manzate [*R.A.M.*, 33, p. 680] was very effective against most species,

while copper fungicides were, as a rule, better than the organic compounds against species of *Cercospora* and *Septoria*, but relatively ineffective against *Colletotrichum* spp.

Variations in response to fungicides were observed among species in the same genus and among form species, alike culturally and morphologically, but differing in pathogenicity. Reasons for the apparent discrepancies between the calculated control efficiency ratings and the actual recommendations made by pathologists are discussed.

Rich (S.) & Horsfall (J. G.). **Thiuram polysulfides as field fungicides.**—*Plant Dis. Reptr*, 38, 7, pp. 434–435, 1954. [Multilithed.]

In field trials at Connecticut Agricultural Experiment Station, New Haven, in 1953 to determine the effectiveness of a series of thiuram polysulphides (from Rohm and Haas Co., Philadelphia, Pennsylvania), compared with standard fungicides against apple scab (*Venturia inaequalis*) [*R.A.M.*, 34, p. 40], tomato early blight (*Alternaria solani*) [34, p. 112], and snapdragon [*Antirrhinum*] rust (*Puccinia antirrhini*) [31, p. 284] the fungicides were applied as wettable powders by hydraulic equipment, disease being estimated in accordance with the Horsfall-Barratt system [25, p. 39]. Phygon XL (½ [oz.] per 100 gals.) and orthocide 406 [captan] (2 oz.) were the most effective on apples, reducing the average percentage of the leaf area covered by scab from 48·8 (untreated) to 1·8; the percentages for LO 765 (tetramethylthiuram tetrasulphide) and LO 738 (ethylenebisthiuram trisulphide, both at 2 oz.) were 6 and 6·6, respectively. Dithane Z-78 (2 oz.) and He 257 (ethylenebisthiuram tetrasulphide, 2 oz.) reduced the average percentage of *Antirrhinum* rust from 39·5 to 3 and 3·3, respectively. On tomatoes dithane Z-78, captan, LO 765 (2 oz. and ½ oz.), and LO 738 reduced the average percentage defoliation from 15 to 3, 4, 4, 4·5, and 6·5, respectively.

Owens (R. G.). **Studies on the nature of fungicidal action. III. Effects of fungicides on polyphenol oxidase in vitro.**—*Contr. Boyce Thompson Inst.*, 17, 8, pp. 473–487, 14 graphs, 1954.

In a further contribution to this series of experiments conducted at the Boyce Thompson Institute for Plant Research, New York [cf. *R.A.M.*, 33, p. 165], *in vitro* tests with a series of dithiocarbamates, bisdithiocarbamates, bis(thiocarbamyl) sulphides and disulphides for their effect on polyphenol oxidase showed that complexes sometimes capable of being dissociated by catechol were formed between the compounds and polyphenol oxidase [34, p. 45]. All the dithiocarbamic acid derivatives except copper salts inhibited the enzyme to some extent. Several metal complexing agents, other than these derivatives, were as inhibitory as dithiocarbamates and formed more stable complexes with the enzyme. The principal effects of chemical constitution on dithiocarbamate inhibition of the oxidase were correlated with stability of the molecule and the enzyme-inhibitor complex. The data indicate that enzymes inactivated by toxic chemicals may sometimes be restored to activity by the action of cell materials, sometimes the enzyme substrate itself, available from metabolic reservoirs and enzymatic action. A satisfactory correlation between the reported fungitoxicity of dithiocarbamates and their inhibition of polyphenol oxidase as reported here appears to exist for *Aspergillus niger* but not for *Penicillium italicum*, *Botrytis cinerea*, or *Rhizopus nigricans* [*R. stolonifer*].

Fransen (J. J.) & Kerssen (Miss M. C.). **Waarnemingen betreffende druppelgroote, verdeling en drift van de spuitvloeistof toegediend met de Piper-Supercub, PA.–18A.** [Observations concerning droplet size, distribution, and drift of the spray liquid applied by means of the Piper-Supercub, PA–18A.]—*Onderz-*

Versl. Inst. plziekt. Onderz., Wageningen, 5, 38 pp., 9 figs., 5 graphs, 1954. [English summary. Mimeographed.]

In the course of spraying campaigns by aeroplane, e.g., against potato blight [*Phytophthora infestans*], in Holland during 1953, observations on droplet size [*R.A.M.*, 33, p. 109 and following abstracts], distribution, and drift of the spray liquid applied by means of the Piper-Supercub apparatus, PA–18A, were made by taking cross-sections of the spray deposit trapped on glass plates and cards, 18 by 13 cm., suspended at a height of 50 cm. over the plots. The mean number of droplets per sq. cm. of the swath was determined and the resultant values converted into the mean number of droplets (TG) per sq. cm. of the effective swath width, measuring 15 m. The amount of spray applied per ha. divided by TG (F) served to measure the fineness of the residue.

The average diameters of droplets of colloidal copper (8 l. in 44 l. per ha.) delivered with a D10–46 nozzle-plate combination at 20 lb. pressure at 60 miles per hour were 520 and 560 μ, the corresponding figure for a concentration of 10 l. in 30 at 50 lb. and 70 m.p.h. and a D8–45 nozzle being 310 μ, while droplets of dithane (17 per cent. suspension at 30 l., D8–45 nozzle at the same pressure and speed) measured 420 and 430 μ. By contrast, the maximum droplet diameter of MCPA (20 lb., 70 m.p.h.) was only 260 μ. Notwithstanding the larger quantity of spray liquid per ha. delivered by the D10 nozzle, the coverage of the crop is less dense and less regular than with the smaller amount from the D8. This is due in part to the very small droplets delivered by the latter, which cannot be used for copper-containing preparations at the requisite strength. The mean weight of the droplets of colloidal copper (10 l. at 30 l. per ha.) delivered by D8–45 on 21st June, calculated on the basis of the dried residue on glass plates and the number of droplets per sq. m., was 2·5γ. A cross-wind of moderate velocity (5m. per second) caused little displacement of colloidal copper, but the coverage of dithane was very adversely affected, precluding its use under such conditions.

Küthe (K.). **Der Einfluß der Spritztropfengröße auf den Erfolg einer Schädlingsbekämpfung.** [The influence of the spray drop size on the successful control of a pest.]—*NachrBl. dtsch. PflSchDienst (Braunschw.), Stuttgart*, 6, 4, pp. 51–54, 1954.

This paper is largely concerned with the relation between the size of the spray drops of insecticides and the efficiency of the control of Colorado beetle [*Leptinotarsa decemlineata*], but some remarks on fungicides are included. The control of fungus diseases with copper-containing sprays is best fulfilled by the use of fungicides composed of fine particles [*R.A.M.*, 31, p. 132; see preceding and next abstracts]. On the other hand, a more lasting effect is produced by coarser particles, in which the decomposition of the active ingredients proceeds less rapidly. In general, the average particle size for mixtures applied at dosages of 100 to 200 l. per ha. should range from 200 to 300 μ, with a minimum of 100 μ and a maximum of 400 μ.

Goossen (H.) & Eue (L.). **Die Verteilung und Regenbeständigkeit von Spritz- und Spritzbrühbelägen im Kartoffelbestand. (Vorläufige Mitteilung.)** [The distribution and resistance to rain of spray and spray mixture deposits in the Potato stand. (Preliminary communication.)]—*NachrBl. dtsch. PflSchDienst (Braunschw.), Stuttgart*, 6, 4, pp. 54–56, 1954.

In over 10,100 determinations by the potassium ferrocyanide colorimetric method [*R.A.M.*, 32, p. 326] of the copper content of spray deposits on potato leaves in field plots at the Münster (Westphalia) Plant Protection Station, fine particles were generally superior to coarse ones [see preceding abstracts] in resistance to rain. Using identical quantities of active ingredients and liquid, a more uniform

distribution of the fungicide over the upper and middle parts of the plant is ensured by the application of low-volume concentrates by the mist-blowing method than by spraying.

Scharmer (J.). **Die Entwicklung des Sprühverfahrens.** [The development of concentrate mist-blowing sprays.]—*NachrBl. dtsch. PflSchDienst (Braunschw.), Stuttgart*, 6, 5, pp. 71–73, 2 figs., 1954.

Technical improvements in concentrate mist-blowing [see next abstract] are fully described from the Horticultural Institute, Heidelberg, Germany, where the method has been found fully as efficient as high-volume spraying, while a considerable saving of labour is effected by the 90 per cent. reduction in the quantity of water required.

The use of a spiral nozzle delivering droplets averaging 60 to 70 μ in diameter is recommended.

Mauch (A.). **Die technischen Erfahrungen mit Sprühgeräten.** [Technical observations on concentrate mist-blowing apparatus.]—*NachrBl. dtsch. PflSchDienst (Braunschw.), Stuttgart*, 6, 5, pp. 73–75, 1 fig., 2 graphs, 1954.

Details are given of the technical features of four concentrate mist-blowing machines which were tested in 1951–2 at the Fruit Research Institute, Jork, near Hamburg [cf. preceding abstract], viz., (1) 'Atomiseur-Pasteur' (Mauser-Werke, Waldeck), (2) Nevel-Spuit [mist spray] 'Kickens-Dekker', (3) Sprühgerät 'Swiss-Atom 350', and (4) 'Atomisator' Modell 51 (Gebr. Holder, Metzingen). Notwithstanding various defects, the machines (improved models of which are now available) presented practical advantages in respect of reduced water transport and some saving and acceleration of labour in comparison with hose sprays.

Specialpræparater til bekæmpelse af plantesygdomme og skadedyr anerkendte af Statens Forsøgsvirksomhed. Gyldig for året 1952. [Special preparations for the control of plant diseases and pests approved by the State Experimental Service. Valid for the year 1952.]—*Tidsskr. Planteavl*, 55, 3, pp. 511–529, 1952.

Analyses are provided of the fungicides and insecticides officially approved for use in Denmark during 1952, [cf. *R.A.M.*, 31, p. 343]. [Similar announcements are made for 1953 and 1954 in *Tidsskr. Planteavl*, 56, 2, pp. 334–337, 1953; ibid., 57, 2, pp. 325–352, 1954.]

Dichlone—a coined name for the fungicidal chemical 2,3-dichloro 1,4-naphthoquinone. Glyodin—a coined name for the fungicidal chemical 2-heptadecyl glyoxalidine acetate.—*Phytopathology*, 44, 7, p. 370, 1954.

The name dichlone has been selected to designate the fungicidal chemical 2,3-dichloro 1,4-naphthoquinone (trade name phygon) [*R.A.M.*, 26, p. 211 *et passim*], and glyodin for the fungicidal chemical 2-heptadecyl glyoxalidine acetate [25, p. 402], sold as fruit fungicide crag 341 [31, p. 190 *et passim*]. These names have been approved by the Interdepartmental Committee on Pest Control and accepted by the American Chemical Society, the American Medical Association, and the American Phytopathological Society.

Moreau (C.). **Les maladies parasitaires des principales cultures coloniales. Revue bibliographique. XI. XII.** [The parasitic diseases of the principal colonial crops. Bibliographical reviews XI and XII.]—*Rev. Mycol.*, 18, *Suppl. colon.* 1, pp. 50–66; 2, pp. 114–126, 1953.

Further notes are given on the principal diseases of colonial crops [cf. *R.A.M.*, 32, p. 438], based on the literature (211 titles in all) published from 1950 to 1953.

Melchior (H.) & Werdermann (E.), Ed. **A. Engler's Syllabus der Pflanzenfamilien mit besonderer Berücksichtigung der Nutzpflanzen nebst einer Übersicht über die Florenreiche und Florengebiete der Erde. I. Band. Allgemeiner Teil. Bakterien bis Gymnospermen. Zwölfte, völlig neugestaltete Auflage.** [A. Engler's syllabus of plant families, with special reference to economic plants together with a survey of the floral kingdoms and floral regions of the earth. Volume I. General part. Bacteria to Gymnosperms. Twelfth, entirely revised edition.]—iv+367 pp., 140 figs., Berlin-Nikolassee, Gebr. Borntraeger, 1954. DM. 40.

In this new edition of Engler's well-known Syllabus E. W. Schmidt and E. Werdermann are responsible for sections I and XII, dealing with bacteria and actinomycetes (pp. 41–50) and fungi (pp. 138–204). The treatise is on the same lines as before but is thoroughly revised and brought up to date.

Ingold (C. T.). **Presidential address : fungi and water.**—*Trans. Brit. mycol. Soc.*, 37, 2, pp. 97–107, 1 pl., 1954.

The author discusses the role of water in the life processes of fungi from the aspects of desiccation during dispersal, germination and subsequent development, the moisture content of the substratum, the production of aerial structures and their water relations, spore discharge [*R.A.M.*, 33, p. 103], xerophytic fungi, primitive and remigrant aquatics (submerged), and spore shape in relation to an aquatic environment.

Kelly (C. D.) & Pady (S. M.). **Microbiological studies of air masses over Montreal during 1950 and 1951.**—*Canad. J. Bot.*, 32, 5, pp. 591–600, 1954.

From September, 1950, to December, 1951, 978 exposures of agar plates were made in the General Electric sampler and the Bourdillon slit sampler and 87 with silicone-coated slides in the slit sampler at the top of the Sun Life Building 400 ft. above ground level to determine the numbers of bacteria and fungi in air masses over Montreal, Canada [*R.A.M.*, 33, p. 743]. Most of the air sampled was continental polar; maritime polar air from the Atlantic was encountered on 21 days and from the Pacific on one day, and maritime tropic air from the Gulf of Mexico twice. Low counts of bacteria and fungi were obtained in all air masses from January to March. High fungus numbers were recorded from May to November covering a range from 5 to 56·3 per cu. ft. The counts from both continental polar and maritime polar air were higher when the mass had passed over considerable cultivated land than when moving direct to Montreal.

Keitt (G. W.). **Introduction to the Symposium on Genetics of Phytopathogenic Fungi in Relation to Basic Problems of Infectious Disease.**—*Phytopathology*, 44, 7, p. 337, 1954.

This brief outline of recent advances in the study of genetics of phytopathogenic fungi, introducing the symposium on this subject in relation to basic problems of infectious disease, arranged jointly by the Mycological Society of America and the American Phytopathological Society, is based on eight contributions to the literature.

Wheeler (H. E.). **Genetics and evolution of heterothallism in Glomerella.**—*Phytopathology*, 44, 7, pp. 342–345, 1 diag., 1954.

The latest acquisitions to the knowledge of sexuality in the genus *Glomerella* [*R.A.M.*, 31, p. 73] are reviewed in this paper presented at the Symposium on Genetics of Phytopathogenic Fungi in Relation to Basic Problems of Infectious Disease at Madison, Wisconsin, on 7th September, 1953.

Pontecorvo (G.) & Sermonti (G.). **Parasexual recombination in Penicillium chrysogenum.**—*J. gen. Microbiol.*, 11, 1, pp. 94–104, 1 pl., 1954.

The authors report in greater detail work in the Department of Genetics, University of Glasgow, on the parasexual cycle in *Penicillium chrysogenum* [cf. *R.A.M.*, 32, p. 580] as the result of applying Roper's technique for the isolation from filamentous fungi of strains carrying in their hyphae diploid nuclei heterozygous for known markers, with minor modifications, including the use of 'dwarf' (stunted growth) mutants for growing balanced heterokaryons. It is believed that the vegetative production of new strains from heterozygous diploids could be marshalled for the deliberate breeding of improved industrial strains.

Sequeira (L.). **Nuclear phenomena in the basidia and basidiospores of Omphalia flavida.**—*Mycologia*, 46, 4, pp. 470–483, 20 figs., 1954.

Application of the aceto-orcein squash technique in cytological studies at the Biological Laboratories, Harvard University, Massachusetts, of basidia and basidiospores of *Omphalia flavida* [*Mycena citricolor*] showed that the haploid chromosome number is six and the nuclear behaviour variable, so that the fungus may be homo- or heterothallic according to the number and nature of the nuclei in the spores.

Johnson (T. W.) & Tucker (G. W.). **A technique for the removal of conidia from agar cultures.**—*Mycologia*, 46, 3, pp. 384–385, 4 figs., 1954.

A glass tube with a diameter slightly smaller than that of the mouth of the culture vessel and having a small hole in the end nearest the flask stopper allows glass beads to fall out when tilted. The tube is held in position above the medium on which the fungus is growing by means of a glass rod handle passing through the stopper. A small glass tube, stoppered with a serum bottle cap, also inserted in the stopper, serves as an inoculating tube.

When the spores are ripe the culture flask is tipped so that the beads fall on the fungus mat, and is then shaken vigorously. Sterile water or liquid medium for gathering the dislodged spores in suspension is injected through the inoculating tube through which aliquots are withdrawn aseptically. The apparatus was devised by the United States Army Chemical Corps, Washington, D.C.

Bakerspigel (A.). **Permanent unstained mounts of fungi.**—*Mycologia*, 46, 4, pp. 523–526, 1954.

A method used at the Provincial Laboratory of Public Health, University of Alberta, is described for making permanent unstained mounts of fungi in tissues, with the substitution of air-drying at room temperature for liquid dehydrants. The material is cleared in a few drops of 10 per cent. potassium hydroxide for three to five minutes or longer, washed, and left to dry in the air at room temperature. A few drops of synthetic resin (piccolyte or harleco) are pipetted over the specimen and a cover-slip applied. Stained mycelium may be prepared in the same way.

For cultures a Van Tieghem cell culture is prepared and when the spores or other desired structures have developed the cover-slip bearing the culture is removed, dried in air, and inverted over the resin on a slide.

Girenko (V. N.). Новый способ определения некоторых заболеваний и повреждений Картофеля и плодов Цитрусовых. [A new method of detecting certain diseases and injuries of Potatoes and Citrus fruits.]—Сад и Огород [*Orchard & Garden*], *1954*, 8, pp. 29–31, 2 col. pl. (opposite p. 80), 1 fig., 1954.

An apparatus designed at the Institute of Trade Equipment, Leningrad, U.S.S.R., is used for the diagnosis of diseases of potatoes and citrus fruits. The essential part is a quartz-mercury-vapour lamp (PRK–4) with a light filter [cf. *R.A.M.*, 33, p. 683]. Healthy lemon fruits fluoresce yellow and mandarins and oranges

orange. Patches of blue mould [*Penicillium italicum*] on lemons show a dark grey centre encircled with bluish colour and a pale yellow border. Fluorescent analysis was particularly effective with potatoes. Sections of tubers infected with *Phytophthora* [*infestans*] fluoresce bluish where diseased, the colour being noticeable sometimes long before symptoms appear. Ring rot [*Corynebacterium sepedonicum*] appears greenish.

Isaac (I.). **Studies in the antagonism between Blastomyces luteus and species of Verticillium.**—*Ann. appl. Biol.*, 41, 2, pp. 305–310, 2 graphs, 1954.

In work at University College, Swansea, *Blastomyces luteus* was shown to be antagonistic in culture to *Verticillium albo-atrum* and *V. dahliae* over a wide range of temperatures and irrespective of the pH value of the medium. Grown on Dox's and potato dextrose solutions, *B. luteus* produced an exudate which, added to agar media, inhibited the growth of both species. When *B. luteus* mycelium was added to soil infested with *V. albo-atrum* or *V. dahliae* and planted with tomato and antirrhinum seedlings the incidence of wilt was markedly reduced.

McGray (R. J.) & McDonough (E. S.). **Antimycotic effects of an extract of Catalpa.**—*Mycologia*, 46, 4, pp. 463–469, 2 figs., 1 graph, 1954.

In further studies at Marquette University, Milwaukee, Wisconsin, the extractive from the heartwood of *Catalpa speciosa* [*R.A.M.*, 30, p. 204], assayed for fungistatic activity by a duplicate impregnated filter-paper method, more or less retarded all the fungi studied. Wood-rotting fungi considered as a group had the highest percentage inhibition, human pathogens were slightly less inhibited, and saprophytes were retarded least. Of the wood-rotting fungi, *Poria microspora* was inhibited most (85 per cent.) and *Schizophyllum commune* least (43 per cent.), *Polyporus sulphureus* and *P.* [*Polystictus*] *versicolor* being intermediate. *Pythium debaryanum* was inhibited 64 per cent. and *Rhizoctonia* [*Corticium*] *solani* 72 per cent. *Aspergillus niger* was the most resistant (31 per cent. inhibition).

Dorset (B. C. M.). **Some interesting aspects of the rot-proofing of Cotton fabrics. I, II.**—*Text. Mfr*, 80, 956, pp. 421–425, 4 figs., 5 graphs; 957, pp. 474–477, 1954.

Up-to-date developments in the application of fungicides for the treatment of cotton fabrics against microbiological rotting, e.g., by *Cladosporium herbarum* and species of *Diplodia* [*R.A.M.*, 31, p. 327] and *Pestalotia*, are discussed with reference to some important contributions to the literature. Some formulae in current use are cited to illustrate the diversity of molecular structure in fungicidal substances. Methods for the chemical modification of cellulose, e.g., by treatment with formaldehyde, esterification with acetic or phosphoric acid, and cyanethylation, have recently assumed considerable importance. Suitably employed, they are capable of enhancing the resistance of cotton fabrics to invasion by micro-organisms.

Tremaine (J. H.) & Miller (J. J.). **Effect of six vitamins on ascospore formation by an isolate of bakers' yeast.**—*Bot. Gaz.*, 115, 4, pp. 311–322, 4 graphs, 1954.

In investigations on *Saccharomyces cerevisiae* in Ontario, Canada, vitamins B and P were found to be necessary for growth, though the need for P was slowly overcome. Production of asci was largely determined by the vitamin content of the pre-sporulation medium; few of them were four-spored in the absence of vitamin I and few were formed without B. Vitamins N, T, Py, and I all stimulated sporulation when added to the pre-sporulation medium containing B and P.

Brown (Frances C.), Bradsher (C. K.), Bond (Sara M.), & Grantham (R. J.). **Mildew-preventing activity of rhodanine derivatives.**—*Industr. Engng Chem.* (*Industr.*), 46, 7, pp. 1508–1512, 1 graph, 1954.

The most effective compounds found in the course of this study on 44 derivatives

of rhodanine or 3-substituted rhodanines and six derivatives of dioxothiazolidine, judged by their efficacy in the control of *Chaetomium globosum* on cotton cloth in soil-burial tests [*R.A.M.*, 33, p. 44], were 5(2-thenylidene)rhodanine and 5-(*p*-chlorobenzylidene)rhodanine.

Wright (Joyce M.). **The production of antibiotics in soil. I. Production of gliotoxin by Trichoderma viride.**—*Ann. appl. Biol.*, 41, 2, pp. 280–289, 1954.

Two soils were used in a further study in this series [*R.A.M.*, 32, p. 30]: a highly acid, sandy podsol from Wareham Heath (pH 4·5 to 5·2) and a less acid garden loam (pH 5·6 to 6·5). High yields of an antibiotic substance, which bioassays [loc. cit.] showed to be similar to gliotoxin, were obtained from both soils when they were inoculated with a gliotoxin-producing strain of *Trichoderma viride*, after being supplemented with organic material and then autoclaved. The autoclaved Wareham soil supported production of the antibiotic even when unsupplemented, but under the same conditions there was little or no production in the garden soil. Yields of the antibiotic were increased by adding calcium hydroxide to the Wareham soil and sulphuric acid to the garden soil, indicating that the effect of these additions was not due to a simple shift of pH. The beneficial effect of autoclaving the soil was found to be due to elimination of the microflora, increase in availability of nitrogen compounds, and increase in available carbon compounds, the last being considered the most important factor.

Smith (R. M.), Peterson (W. H.), & McCoy (Elizabeth). **Oligomycin, a new antifungal antibiotic.**—*Antibiot. & Chemother.*, 4, 9, pp. 962–970, 1 graph, 1954.

A report is presented from the Departments of Bacteriology and Biochemistry, University of Wisconsin, on the preparation, physical and chemical properties, and biological activity of oligomycin, which is produced in submerged culture by a soil organism resembling *Streptomyces diastatochromogenes*. It proved strongly inhibitory in twofold dilution agar-streak tests at 25° C. to a number of plant pathogens, including *Chalara quercina* at 0·08 µgm. per ml., *Colletotrichum circinans* and *Verticillium albo-atrum* at 0·6, *C. lagenarium* at 0·3, *C. pisi* at 1·1, *Pythium debaryanum* at 3·5, and *Penicillium expansum* at 5.

Patrick (Z. A.). **The antibiotic activity of soil microorganisms as related to bacterial plant pathogens.**—*Canad. J. Bot.*, 32, 5, pp. 705–735, 3 pl., 4 graphs, 1954.

In an attempt to evaluate the importance of antagonism as a possible factor in the different survival capabilities of some bacterial plant pathogens in soil [*R.A.M.*, 33, p. 369; 34, p. 99], a comparison was made in the Department of Botany, University of Toronto, of the numbers of antagonists detected when certain pathogens were used as test organisms in determining the antibiotic potential of nine Ontario 'virgin' soils (i.e., not planted to crops for at least ten years). The soil flora was found to include numerous micro-organisms (fungi, actinomycetes, and bacteria) intrinsically capable of antagonizing most of the bacterial pathogens tested. There were great differences in the numbers of isolates antagonistic to the different species, even in the same genus, and there appeared to be a correlation between the numbers of antagonists and the ability of a species to maintain itself in the soil for long periods. On the whole the *Xanthomonas* spp. were the most sensitive to the antagonistic soil microflora and the soft rot *Erwinia* spp. the most resistant.

A comparative study of the antibiotic activity of 120 of the most active antagonists against 28 bacterial plant pathogens disclosed that each antagonist was characterized by a specific antibacterial spectrum and that the antagonists having the most marked activity usually inhibited the greatest number of bacteria. Many antagonists acted only against particular groups or species, this high specificity permitting the consistent differentiation between such closely related species as

E. carotovora and *E. atroseptica* [? strain of *E. carotovora*: 32, p. 448] or *X. corylina* and *X. juglandis*.

Krasil'nikov (N. A.). Микробы-антагонисты и антибиотические вещества как факторы устойчивости растений к инфекциям. [Microbe-antagonists and antibiotic substances as factors in the resistance of plants to infection.]—Докл. Акад. Наук СССР [*C.R. Acad. Sci. U.S.S.R.*, N.S.], 94, 6, pp. 1177–1180, 1 fig., 1954.

In experiments in the U.S.S.R. bean [*Phaseolus vulgaris*], wheat, and cotton seedlings absorbed biomycin, globisporin, and terramycin [*R.A.M.*, 33, p. 545] from sterilized and non-sterilized soil, to which the substances had been applied at the rate of 500 to 800 units per ha., but more from sterilized. Plants also absorbed crude antibiotics from culture liquids.

Sap from plants grown in fertilized soil high in humus and in fields rich in antagonists was more bactericidal than that from plants in unfertilized soil with few antagonists or grown in glass houses.

Hopkins (J. C.). **A centrifuging method for root sterilization.**—*Nature, Lond.*, 174, 4439, p. 1016, 1954.

The mycorrhizal fungi present in root tissues were isolated without difficulty in the Department of Botany, Royal Botanic Garden, Edinburgh, after surface sterilization of the roots by the following means. A small glass tube with a piece of fine muslin stretched across the top and secured with adhesive tape, and having its base wrapped in cotton wool, was fitted within a Pyrex centrifuge tube containing sufficient sterile water to cover the muslin. The roots were washed thoroughly in detergent, placed on the muslin, and centrifuged three times for three to four minutes at 7,500 revolutions per minute. After each centrifuging they were shaken vigorously in two tubes of sterile water to dislodge any contaminants still adhering to the root surface.

Levisohn (Ida). **Occurrence of ectotrophic and endotrophic mycorrhizas in forest trees.**—*Forestry*, 27, 2, pp. 145–146, 1954.

A Lawson's cypress (*Chamaecyparis lawsoniana*) tree, growing in a heathland soil in southern England, having been in check for some years, began to grow vigorously after mulching about eight years ago. In the autumn of 1953 it was noted that large portions of the dense mat of roots in the mulch were infected by the endotrophic mycorrhiza characteristic of Lawson's cypress, while a few of the root branches bore conspicuous nodules of typically ectotrophic tuber-mycorrhiza [cf. *R.A.M.*, 32, p. 637].

Zähner (H.). **Die Bestimmung der Fusarinsäure mit Hilfe der Papierchromatographie.** [The determination of fusarinic acid with the aid of paper chromatography.]—*Phytopath. Z.*, 22, 2, pp. 227–228, 1 graph, 1954.

Two methods are described for the determination of fusarinic acid, a wilt-inducing toxin produced by *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, 32, p. 700; 34, p. 112], by means of paper chromatography. In one the paper is sprinkled with a solution of brom cresol green (40 mg. in 100 ml. water), adding sodium hydroxide until the colour changes to blue, when a pale pink border appears below the yellow fusarinic acid spot. In the alternative technique paper strips are laid on a culture of *Bacillus subtilis* and incubated at 37° C. for 12 hours, at the end of which fusarinic acid becomes discernible asa pale spot on the turbid plate.

The quantitative determination of the toxin is made on the basis of absorption in ultra-violet light.

Sarasola (A. A.) & Abiusso (N.). **Acción tóxica de filtrados de cultivos de 'Alternaria tenuis' sobre Olivo y Tomate.** [The toxic action of culture filtrates of '*Alternaria tenuis*' on Olive and Tomato.]—*Rev. Fac. Agron. Eva Perón* (formerly *Rev. Fac. Agron. B. Aires*), Ser. 3, 29, 1, pp. 67–71, 1 pl., 1953. [English summary. Received 1954.]

At the Faculty of Agronomy, Buenos Aires, culture filtrates of *Alternaria tenuis* (isolated from olive) in Czapek's liquid medium caused wilting of tomato cuttings, and when injected into olive twigs induced the main symptoms of the disease known as 'alternariosis' [*R.A.M.*, 30, p. 174]. Similar results were obtained with filtrates sterilized for 20 minutes at 120° C.

Brancato (F. P.) & Golding (N. G.). **The influence of concentrated substrates on the diameter attained by the fungus colony.**—*Mycologia*, 46, 4, pp. 442–456, 16 graphs, 1954.

Continued studies on the diameter attained by colonies of *Aspergillus niger*, *A. flavus*, *Penicillium notatum*, *P. expansum*, *P. roqueforti*, and *Geotrichum candidum* [*R.A.M.*, 33, p. 367] on malt agar enriched with various substances suggested that osmotic pressure changes are an important factor shaping growth curves. *G. candidum* and *P. roqueforti* were the most sensitive to high osmotic concentrations, especially the former. Ethylene glycol was toxic to all the fungi. *P. roqueforti* tolerated high concentrations of glycerol, though as a carbon source for *A. niger* and *A. flavus* [see next abstract] it was not as stimulatory as glucose and sucrose. *P. notatum* was more tolerant of increased sodium chloride concentrations than the others, growth declining more rapidly on a glucose-enriched substrate than on one containing salt. It is concluded that no single explanation can account completely for the growth stimulation resulting when certain substances are added to an adequate medium. For each case careful studies are required of the chemical characteristics of the substances involved, the physico-chemical properties of their solutions, and the physiological and morphological responses of the organism.

Barinova (Mme C. A.). Влияние углекислоты на рост плесневых грибов. [The influence of carbon dioxide on the growth of mould fungi.]—Микробиология [*Microbiology, Moscow*], 22, 4, pp. 391–398, 1953.

In experiments at the Institute of Microbiology, U.S.S.R. Academy of Sciences, Moscow, atmospheric carbon dioxide [*R.A.M.*, 33, p. 49] stimulated the growth of *Aspergillus niger*, *A. flavus* [see preceding abstract], *Rhizopus nigricans* [*R. stolonifer*], and *Penicillium chrysogenum*, particularly during the first stages of development. The stimulation was greatest in *A. flavus* and *P. chrysogenum* and least in *R. stolonifer*. Increasing the carbon dioxide content up to 1 per cent. (6 l. per hour) hindered the growth of *A. niger*, but not of *A. flavus*.

Johnson (S. P.) & Joham (H. E.). **Some physiological notes on Sclerotium rolfsii. I. Utilization of certain carbon compounds.**—*Plant Dis. Reptr*, 38, 8, pp. 602–606, 1954. [Multilithed.]

At the Texas Agricultural Experiment Station the growth of *Sclerotium rolfsii* [*R.A.M.*, 33, p. 276] in a synthetic nutrient solution was best with hexoses and disaccharides, but the fungus could utilize materials ranging from simple pentoses to complex polysaccharides, gums, and protein. In mixtures, glucose generally stimulated the utilization of pentoses, but inhibited that of more complex carbohydrates.

Darby (R. T.) & Mandels (G. R.). **Inorganic nutrition of Myrothecium verrucaria.** —*Mycologia*, 46, 3, pp. 276–288, 3 figs., 1 graph, 1954.

Further experiments by the United States Army Quartermaster Corps, Phila-

delphia, on the growth of *Myrothecium verrucaria* [*R.A.M.*, 33, p. 618] in relation to nutritional substrate demonstrated that optimum concentrations of inorganic salts vary with the type of growth required. Variations from one experiment to another, using the same nutrient solution, were as great as, or greater than, those induced experimentally. Growth type was markedly affected by modification of the inorganic nutrients; it was good with either nitrate or ammonium when the pH was controlled, but even better (with sucrose) with organic nitrogen.

Wager (R. M.). Столбурное увядание Картофеля. [Stolbur wilt of Potato.]—Микробиология [*Microbiology, Moscow*], 22, 2, pp. 198–202, 1953.

Premature wilting of spring-sown potatoes is very widespread in some areas of southern Russia. Field investigations at the Moscow Station of the Pan-Soviet Institute of Plant Protection indicate that it is due to stolbur [tomato big bud virus: *R.A.M.*, 27, p. 48], wilting being characteristic of this disease irrespective of the secondary infection by species of *Fusarium*. The chief differences between the two types of wilt lie in the morphological changes of the top and streakiness of the shoots peculiar to stolbur and the decay of the stem base characteristic of *Fusarium*.

Paul (H.-L.). **Studien zum quantitativen Nachweis des X-Virus auf Gomphrena globosa.** [Studies on the quantitative estimation of the X-virus on *Gomphrena globosa*.]—*Zbl. Bakt.*, Abt. 2, 108, 1–3, pp. 7–18, 1 fig., 2 graphs, 1954.

In experiments at the Brunswick branch of the German Biological Institute from June to October, 1953, two contrary tendencies were observed in the reaction of *Gomphrena globosa* leaves to inoculation with potato virus X [cf. *R.A.M.*, 32, p. 607; 34, p. 56]. In the first place, there are large numbers of single lesions on older leaves but fewer on young ones, and secondly, the sharpness of definition characteristic of the spots on young leaves declines on older material. For plants with six nodes the leaves of the third and fourth are generally the most suitable for inoculation. In serial dilution tests abrasion with carborundum greatly increased the number of lesions but simultaneously contributed to their rapid disappearance at high dilutions.

Kanngiesser (W.) & Deubner (B.). **Veränderungen des elektronenmikroskopischen Bildes von Kartoffel-X-Virus unter dem Einfluß verschiedener Chemikalien.** [Changes in the electron-microscopic picture of Potato virus X under the influence of various chemicals.]—*Arch. ges. Virusforsch.*, 5, 5, pp. 483–496, 9 figs., 1954.

Electron microscope studies of a 0·5 per cent. solution of potato virus X, described in this joint report from the Institute for Applied Chemistry, Hann.-Münden, and the Institute for Electromedicine and Electronic Technique, Munich, Germany, showed that the most powerful action on the form of its particles was exerted by 10 per cent. sodium chloride, half an hour's contact with which resulted in extensive atypical agglomerations, presumably culminating in the destruction of the virus. Potassium chloride acted similarly but more slowly. Urea and saponin at 50 and 25 per cent., respectively, did not appreciably modify the structure of the virus, whereas 0·1 per cent. acetocarmine, 0·1 per cent. acridine orange, and 0·05 per cent. Victoria blue induced the most diverse morphological alterations, and fuchsin caused precipitation with consequent reduction of the virus concentration. The stability of potato virus X in dilute glycerin over a period of months, already demonstrated by Bercks [*R.A.M.*, 31, p. 510], was confirmed in these experiments.

Cook (A. A.). **Potato freckles.**—*Plant Dis. Reptr*, 38, 7, pp. 458–459, 1 fig., 1954. [Multilithed.]

During the summer of 1952 leaflets on several Bliss Triumph potato plants in

South Dakota were observed to be unusually flaccid and distinctly chlorotic, except for patches of normal green tissue. The exact nature of this condition is unknown, but laboratory experiments at the Department of Plant Pathology, South Dakota State College, Brookings, indicate that it is associated with strains of potato virus X [*R.A.M.*, 34, p. 55] which were isolated from the affected material.

Large (E. C.), Taylor (R. E.), Storey (I. F.), & Yule (A. H.). **Spraying trials in the Potato-growing area around the Wash, 1948–53.**—*Plant Path.*, 3, 2, pp. 40–48, 4 graphs, 1954.

The results are presented of spraying trials against potato blight (*Phytophthora infestans*) [*R.A.M.*, 33, p. 376], carried out at the National Agricultural Advisory Service Experimental Husbandry Farm, Terrington St. Clement, Norfolk, in an area where blight occurs earlier and progresses more rapidly than elsewhere in the east of England. The treatments applied were: (1) wet spraying by a 13 row machine spraying above and below the leaves, and applying a copper oxychloride preparation (50 per cent. copper; 6 lb. in 100 gals. water per acre), except in 1949 when Burgundy mixture (15·5 per cent. copper; 22½ lb.) was substituted, and 1948 (no wet spraying); (2) atomizing by a 13-row Agro machine, spraying above and below the leaves, and applying the copper oxychloride (6 lb. in 15 gals.), except in 1949, when a cuprous oxide preparation (50 per cent. copper; 5 lb. in 20 gals.) was substituted, and in 1953, when top spraying (above the plants only) was carried out with a 10-row, low-volume sprayer applying copper oxychloride (6 lb. in 15 gals.); (3) dry dusting, by an 11-row duster applying about 25 lb. of copper–lime dust (24 per cent. copper) per acre.

In 1948 and 1949 two wet sprayings or atomizings were compared with four dustings; in the other years three wet treatments were compared with six dustings. In 1949 and 1952 no blight occurred; in 1951 the attack was very late, but in 1948, 1950, and 1953 it began in July and reached the 75 per cent. stage by about mid-August [32, p. 585].

In all years yields (estimated by taking the crop from four 33-yard lengths of row in each plot, two damaged by wheels and two undamaged) were decreased by wheel damage. In dry years there were losses from phytotoxic effects. With King Edward ('A'), grown every year, and also Majestic in 1951–3, the mean gains per acre from wet spraying or atomizing (about equally effective) were about 1 ton in 1948, 3 tons in 1950, and 2½ tons in 1953; in 1949 and 1952 there was a mean loss of about 2 tons, and 1951 there was neither loss nor gain. Over the whole period the average gain was about 8 cwt. [per acre] per year.

Dusting, though giving a larger yield than atomizing in 1948, was less effective in the other 'blight' years, with no average gain over the whole period. The mean loss sustained in the rows damaged by wheels in all years and for all treatments was about 2·3 tons per acre (13 per cent. of the potential yield).

These results, taken in conjunction with past records and observations made during the blight-forecasting survey in 1950–3 [loc. cit.], indicate that in the area concerned three years in ten may be expected to be blight years (for King Edward), and the gain from efficient spraying would probably be 2 to 3 tons per acre on the heavier crops. In another two years out of ten blight might reach the 75 per cent. stage by the end of August, with a net gain of about one ton per acre; in another two the disease will probably not reach the 75 per cent. stage until mid-September, and any small gain from spraying will be lost by wheel damage. In the remaining three years there will probably be no blight and spraying will entail considerable losses. The gain from spraying Majestic in blight years may be expected to be less than that for King Edward.

Treatments in June appear to be unnecessary in most years. In general, the optimum time for a precautionary first spraying in the area concerned is about the

end of the first week of July, when the machines can usually get through the haulms without causing appreciable damage. The second spraying can be deferred until outbreaks have been seen or forecast for the district. If rain follows the second spraying a third may be given.

Andrén (F.). **Besprutningsförsök mot Potatisbladmögel 1953.** [Spraying tests against Potato blight 1953.] *Växtskyddsnotiser, Stockh.*, *1954*, 2 3, pp. 23–27, 2 figs., 1954.

Tests carried out in 1953 on the experimental plots of the Plant Protection Institutes at Nyckelby and Åkarp, Sweden, showed spraying to be effective as a preventive of potato blight [*Phytophthora infestans*: *R.A.M.*, 33, p. 175]. Fair correlation was observed between leaf blight incidence on haulms and the amount of rot in the tubers, though the results were somewhat obscured by a simultaneous attack of soft rot [*Erwinia* spp.]. The variety Up-to-Date was sprayed twice at Nyckelby and three times at Åkarp at the rate of 1,000 l. per ha. All the preparations produced better yields and less leaf blight than the unsprayed, copper compounds giving slightly better protection than the carbamates (aaphytora, d[ithane] Z 78, and zinebtan), but the average crop was slightly higher following carbamate treatment. A mercurial powder was the least effective. The test has shown that, contrary to opinions previously held, the number of carbamate applications can be reduced to the same as for copper products. The spraying must be done before the attack has started and no less than 600 l. of fungicide and for copper preparations 3 kg. copper per ha. should be used at each application. If the treatment is immediately followed by rain, it must be repeated. A valuable complement to spraying is the killing of the haulms, provided it is complete.

Chambers (S. C.). **Testing Potato haulms for resistance to Irish blight.** *J. Dep. Agric. Vict.*, 52, 10, pp. 456–459, 3 figs., 1954.

In 1950 the Plant Breeding Branch of the Department of Agriculture, Victoria, decided to test all available potato hybrids and varieties for resistance to *Phytophthora infestans* [cf. *R.A.M.*, 32, p. 236] for the incorporation of parental material in a breeding programme. An initial experiment in 1951 on the haulms of 25 varieties and hybrids revealed that the variety Kennebec and the hybrids Black 914 A(12) and S 2674 had resistant haulms.

The investigation was continued in 1952 with tubers of 22 varieties and hybrids obtained from the Department's Potato Research Station at Toolangi. These were maintained in a testing chamber at a constant relative humidity of 100 per cent. and a temperature of 60° to 70° F. (conducive to optimum vegetative growth and asexual reproduction of the pathogen) and the seedlings sprayed individually with a suspension containing 3,000 spores per ml. at a rate of 900 ml. to 64 plants. After seven days in the cabinet the reaction of each plant was assayed by using ranges of symptom expression on the leaves and stems based on those of Bonde *et al.* [20, p. 30], i.e., classes 0 (no visible symptoms) to 4 (obvious symptoms), subdivided into symptom expression values 0 to 24. The most resistant, according to these foliage and stem symptom expression values, to the strain of the fungus used were 76 15 (2·2, 0·5), Kennebec (2·2, 0·9), 75 1 (2·3, 0·5), Black 914 A(12) (2·4, 0·4), 77–3 (5·2, 0·5), and S 2674 (6·1, 2·9).

Fuchs (W. H.) & Kotte (Eva). **Zur Kenntnis der Resistenz von Solanum tuberosum gegen Phytophthora infestans de By.** [Contribution to the knowledge of the resistance of *Solanum tuberosum* to *Phytophthora infestans* de By.]—*Naturwissenschaften*, 41, 7, pp. 169–170, 1954.

A preliminary account is given of experiments at the Institute for Plant Pathology and Plant Protection, Göttingen, Germany, to determine the capacity of

certain narcotics and fermentative toxins to break down the resistance of Aquila potato tubers to race A of *Phytophthora infestans* [*R.A.M.*, 29, p. 380]. The scale used for the assay of toxicity of the substances ranged from 0 (highly resistant, i.e., pronounced necrosis with no fructification of the fungus) to 5 (highly susceptible, with profuse fructification and gradual necrosis). The following ratings were assigned: 10^{-3} M 'sodium acid', $\frac{4}{5}$; 10^{-3} phenylurethane, $\frac{3}{5}$; 10^{-3} sodium fluoride, 3; 10^{-2} thiourea, 1; potassium cyanide, *p*-nitrophenol, and sodium diethyldithiocarbamate, all at 10^{-3}, $\frac{2}{3}$; and salicylaldoxim and kupferron, both at 10^{-4}, $\frac{1}{2}$.

Houghland (G. V. C.) & Cash (L[illian] C.). **The use of vermiculite in providing scab inoculation for Potatoes.**—*Plant Dis. Reptr*, 38, 7, pp. 460-461, 1 fig., 1954. [Multilithed.]

Two methods of inoculation with *Streptomyces* [*Actinomyces*] *scabies* which have proved very effective in establishing potato scab in the field at the Horticultural Crops Research Branch, United States Department of Agriculture, [Beltsville, Maryland], are described. A 100 ml. suspension of *A. scabies*, prepared from agar cultures, is added to 1 l. of Richards's solution at pH 7 and mixed with 1 kg. of steam-sterilized vermiculite. For greenhouse experiments this is mixed with 5 kg. of sand and, if nutrient control is being tested, water or the nutrient solution can be substituted for Richards's solution. For field use, the inoculum is kept for five to six days at room temperature and half portions sown over the entire area in opposite directions. Disking should follow immediately.

Where cultures of *A. scabies* are not available, minced peelings from scabbed potatoes may be mixed with sufficient vermiculite to permit easy application. Before applying either inoculum the land should be limed, if necessary, to pH 5·8 to 7.

Richter (H.) & Schneider (R.). **Untersuchungen zur Rhizoctonia-Anfälligkeit der Kartoffelsorten II.** [Studies on the *Rhizoctonia* susceptibility of Potato varieties. II.]—*Züchter*, 24, 9, pp. 264–271, 1 fig., 1 diag., 4 graphs, 1954.

In further field experiments in various parts of Germany [*R.A.M.*, 32, p. 209] from 1950 to 1953, all the 37 potato varieties tested for reaction to *Rhizoctonia* [*Corticium*] *solani* were susceptible, but marked local and seasonal fluctuations precluded co-ordination of the results of individual tests [cf. 34, p. 59]. The average incidence of infection was computed at 26 per cent. None of the 56 wild species and strains of *Solanum* inoculated with *C. solani* by different methods proved to be any less susceptible than the commercial varieties tested. For the present, therefore, the existing possibilities of control, comprising rational cultural methods and fungicidal seed and soil treatments, should engage the continued interest of scientists.

Webb (R. E.) & Larson (R. H.). **Mechanical and aphid transmission of the feathery mottle virus of Sweet Potato.**—*Phytopathology*, 44, 6, pp. 290–291, 1 fig., 1954.

A virus disease of sweet potato resembling feathery mottle virus [*R.A.M.*, 25, p. 93, and next abstract] was found in Wisconsin in 1951 and Louisiana in 1952. The virus was compared with feathery mottle obtained from the Plant Industry Station, Beltsville, Maryland. Both viruses were transmitted to the sweet potato varieties Porto Rico Unit 1, Texas Bunch, Georgia Bunch, Ranger, and L240 by carborundum rubbing, with the development of typical feathering symptoms, and by *Myzus persicae* and cleft-grafting to the three first-named. The initial symptoms were faint chlorotic dots. The disease also appeared in shoots developing from the tuberous roots of infected plants. The results of cross-protection tests indicated a close relationship between the two viruses.

Webb (R. E.). **Some hosts of feathery mottle virus of Sweetpotato.**—*Plant Dis. Reptr*, 38, 7, pp. 448–452, 2 figs., 1954. [Multilithed.]

In greenhouse inoculation experiments at Louisiana Agricultural Experiment Station plants of six varieties of sweet potato and of *Calonyction aculeatum*, *Quamoclit lobata*, *Ipomoea purpurea* variety crimson Rambler, and *Merremia sibirica* were all susceptible to sweet potato feathery mottle virus [see preceding abstract]. Crimson Rambler developed extensive systemic veinal necrosis and may serve as a good indicator plant for the virus.

Williams (A. S.). **Development of foliage symptoms associated with internal cork of Sweet Potato.**—Abs. in *Phytopathology*, 44, 6, p. 334, 1954.

Over a three-year period [at North Carolina State College, Raleigh] roots of Porto Rico, Nancy Hall, and L 240 sweet potato were inoculated by core-grafting with internal cork virus tissue and their sprouts planted in the field [*R.A.M.*, 33, p. 111]. At low temperatures anthocyanin pigmentation developed round the two main symptom types of chlorotic spots and chlorotic vein-banding on the leaves, disappearing with the advent of warmer weather; the correlation was particularly marked in the Porto Rico variety. Low soil fertility was another factor contributing to anthocyanin production.

Rao (P. N.) & Salam (M. A.). **Curvularia species from discoloured grains from Hyderabad—DN.**—*J. Indian bot. Soc.*, 33, 3, pp. 268–271, 1 fig., 1954.

Owing to the increasing prevalence of discoloured cereal grains in Hyderabad, Madhya Pradesh, and Bengal, an investigation was carried out at the Plant Pathology Laboratory, Osmania University, during 1952–3, into the causes of discoloration in rice grains. Sixty per cent. of the darkened grains were found to be infected by *Curvularia* species, including *C. lunata* [*R.A.M.*, 32, p. 34], *C. pallescens*, *C. geniculata*, *C. affinis*, and *C. spicifera* [26, p. 144; 33, p. 21]. *C. penniseti* was present on bajra [*Pennisetum typhoides*].

Pawar (M. S.) & Kulkarni (S. A.). **Piricularia species on Setaria intermedia, Roem and Schult.**—*Curr. Sci.*, 23, 7, pp. 229–230, 1954.

Piricularia oryzae [cf. *R.A.M.*, 27, p. 581; 33, p. 524] was recorded in 1953 on *Setaria intermedia* in a rice seed field in Hyderabad, India. Blast lesions were also present on the rice.

Kondo (G.) & Sugiura (H.). **On the varietal difference of resistance of Paddy Rice to brown spot.**—*Jap. J. Breed.*, 3, 3–4, pp. 76–82, 1954. [Japanese, with English summary.]

In four years' field trials in Japan with 116 varieties of rice the lesions produced by brown spot [*Ophiobolus miyabeanus*: *R.A.M.*, 34, p. 104] ranged from minute dots in the parenchyma between the smaller veins to extensive spots over the larger vein, the several types being characteristic of individual varieties but bearing no relation to the extent of reduction in yield. American varieties tended to develop larger lesions than the Japanese. Wilting of the leaf tips also varied considerably between the varieties but appeared to be associated with nutritional and physiological factors rather than directly connected with the different types of lesions.

Luc (M.). **Cercospora oryzae Miyake sur Riz au Niger.** [*Cercospora oryzae* Miyake on Rice in the Niger region.]—*Rev. Mycol.*, 18, *Suppl. colon.* 1, pp. 66–68, 1 fig., 1953.

Leaves of young rice plants from the vicinity of Kokry, Niger, French West Africa, bore, in addition to lesions caused by *Helminthosporium oryzae* [*Ophiobolus*

miyabeanus: *R.A.M.*, 32, p. 90], a dried, brown discoloration up to 10 cm. long at the tip, on which were identified conidia and conidiophores of *Cercospora oryzae* [C.M.I. map No. 71]. Infection seems to have been favoured by prior attack by *O. miyabeanus*, and the fungus would appear to be a new physiologic race of *C. oryzae*, differing from those already known [cf. *R.A.M.*, 26, p. 261] in its mode of attack and type of lesion.

Langford (M. H.), Carpenter (J. B.), Manis (W. E.), Gorenz (A. M.), & Imle (E. P.). **Hevea diseases of the western hemisphere.**—*Plant Dis. Reptr, Suppl.* 225, pp. 37–41, 1954. [Multilithed.]

In an introductory article to this symposium [see following abstracts] the major diseases and disease problems of rubber (*Hevea brasiliensis*) in the American Tropics are described and discussed with a view to eventual control.

Dothidella ulei [loc. cit.] is now present from Bahia, Brazil, to Mexico, including [C.M.I. map No. 27] Nicaragua, Colombia, Bolivia, and the Guianas [British, French, and Dutch].

Phytophthora leaf blight (*P. palmivora*) [see below, p. 177] is often the most troublesome disease in plantations of clones resistant to *D. ulei*. It caused complete defoliation and extensive die-back in some plantings on the Atlantic coastal plain of Costa Rica during the exceptionally wet 1950–1 season, but some clones at the Rubber Plant Substation, Guapiles, showed remarkably little leaf damage; hybrids of *H. brasiliensis* and *H. benthamiana* were especially promising. Target leaf spot (*Pellicularia filamentosa*) [*Corticium solani*: *R.A.M.*, 33, p. 178] is important only in Peru and Brazil. *Diplodia* [*Botryodiplodia*] *theobromae* [5, p. 690] sometimes reduces the percentage of successful buddings to disastrously low levels. It is satisfactorily checked by treatment with 20 per cent. fermate before and after cutting and prior to shipment. *Helicobasidium* root disease [*H.* sp.: cf. 26, p. 417] has caused losses in nurseries. *Fomes lignosus* occurs most commonly in Costa Rica and Mexico [C.M.I. map No. 176]. *F. noxius* [No. 104] is believed to be the cause of the typical brown root disease present in field plantings at Belterra Estate, Brazil, for a number of years.

Ceratostomella [*Ceratocystis*] *fimbriata* [*R.A.M.*, 29, p. 118; 33, p. 753] is serious only on old *Hevea* trees in Mexico. Pink disease (*Corticium salmonicolor*) [26, pp. 334, 417], widely scattered but not very harmful, has caused some damage on the west coast of Guatemala [C.M.I. map No. 122]. *Glomerella* die-back (*G. cingulata*) [see below, p. 177] is one of the most prevalent diseases in the lower Amazon Valley, but was well controlled at Belém and Belterra by an application of complete fertilizer. Black crust (*Catacauma huberi*) [*R.A.M.*, 26, p. 334], confined largely to the Amazon basin, is the most conspicuous but least destructive of all rubber diseases. *Periconia* blight (*P. heveae*) [26, p. 417], though very destructive on rubber and other *H.* species during prolonged rainy periods, is practically non-existent during the dry season. It is reported in Costa Rica, where some blight-resistant clones have been damaged, Bahia, and Mexico.

Langford (M. H.) & Townsend (C. H. J.). **Control of South American leaf blight of Hevea Rubbertrees.**—*Plant Dis. Reptr, Suppl.* 225, pp. 42–48, 2 figs., 1954. [Multilithed.]

Much of this information on the development of the control of American leaf blight (*Dothidella ulei*) on *Hevea* rubber in Central and South America [see preceding and next abstracts; *R.A.M.*, 30, p. 142; 33, p. 560] has already been noticed in this *Review*. The *Hevea benthamiana* breeding clone F4542 at Belterra, Brazil, has proved immune from all populations of *D. ulei* to which it has been exposed. It gives a high percentage of immune or highly resistant progeny in crosses. A very small percentage gives yields which compare favourably with those of eastern

clones. Some populations of *H. brasiliensis* in the Amazon Valley, particularly in the upper regions, possess a high level of resistance. Different strains of the fungus have been detected, one of which is able to attack resistant Ford top-budded clones. However, the disease is now believed to be within the realm of control.

Manis (W. E.). **Phytophthora leaf fall and dieback.**—*Plant Dis. Reptr, Suppl.* 225, pp. 49–52, 1954. [Multilithed.]

The sudden increase in 1950 of the leaf fall and die-back of *Hevea* rubber caused by *Phytophthora palmivora* [see above, p. 176 and next abstract] at Los Diamantes, Costa Rica, is described. In February, 1951, the disease appeared at Turrialba and on the Speedway Estate. The climatic conditions in the area are believed to be near optimum for the disease most of the year. Some trees were killed outright. At Turrialba leaf fall continued for 10 months. At Los Diamantes the disease spread rapidly through 12 clones resistant to *Dothidella ulei* [see preceding abstract]. It is suggested that F 1620, particularly badly affected, FB 54, FB 3363, F 1619, and FB 3333 should no longer be used for top-working in the Atlantic zone of Costa Rica or anywhere with similar climatic conditions. The following tolerant clones are now recommended for Costa Rica [cf. *R.A.M.*, 33, p. 560]: IAN 45–717 (PB 86 × F 4542), FX 614, FX 469, FX 645, FX 649, FX 590 (all crosses between F 4542 and Tj 1), and IAN 45–443 (Tj 1 × F 409), all having *Hevea brasiliensis* as one parent; F 4542 (*H. benthamiana*) and F 6395 (natural hybrid between *H. spruceana* and *H. brasiliensis*), both cloned jungle selections; and clonal seedlings of F 4542 and F 4541 (*H. benthamiana*). Excellent control in nurseries was secured by spraying once or twice weekly with dithane.

Carpenter (J. B.). **Accelerated screening tests of fungicides for control of black stripe of the Hevea Rubber tree.**—*Plant Dis. Reptr*, 38, 7, pp. 487–493, 1 fig., 1954. [Multilithed.]

At Turrialba and Los Diamantes Experiment Stations, Costa Rica, a more rapid method was developed for the preliminary testing of fungicides against *Hevea* rubber black stripe (*Phytophthora palmivora*) [*R.A.M.*, 33, p. 560 and preceding abstract]. The test material was applied to the tapping cut a few hours after tapping, allowed to dry, and a string inoculator, made by dipping boiled cotton string in a suspension of *P. palmivora*, was placed in the cut. On alternate, non-tapping days the cuts and inoculators were sprayed with more inoculum. One trial could be completed in less than a month.

Of the 22 fungicides tested, only captan (orthocide 50 wettable) was sufficiently promising for further testing under plantation conditions. Filmfast (General Chemical Division, at 0·5 per cent.) was the most satisfactory sticker.

Carpenter (J. B.) & Stevenson (J. A.). **A secondary leaf spot of the Hevea Rubbertree caused by Glomerella cingulata.**—*Plant Dis. Reptr*, 38, 7, pp. 494–499, 1954. [Multilithed.]

Glomerella cingulata was found to be responsible for a secondary leaf spot of *Hevea* rubber [cf. *R.A.M.*, 26, p. 417; 32, p. 507, and above, p. 176] at Turrialba, Los Diamantes, and Cairo, Costa Rica. Inoculation experiments indicated that although the fungus is most commonly associated in nurseries with primary infection by *Dothidella ulei* [loc. cit.] it is able to infect directly, following mechanical injury to the leaves, sunscald, tipburn, or during prolonged periods of cloudy, wet weather. The leaf spot is of minor importance in nurseries sprayed with dithane Z–78 or parzate for the control of *D. ulei* [33, p. 178] but can be serious on unsprayed trees resistant to *D. ulei*, which may still develop a few lesions that serve as infection courts for *G. cingulata*.

Schoon (G. F.) & Zeehuisen (J. J.). **Chemically preserved sheets.**—*Arch. Rubbercult. Ned.-Ind., 1953*, Extra Nummer 2, pp. 241–267, 2 figs., 1 diag., 1 graph, 1953.

A detailed, fully tabulated account is given of laboratory experiments at the Indonesian Rubber Research Institute and estate trials in Java on the chemical preservation of raw rubber sheets against [unspecified] moulds [*R.A.M.*, 18, p. 272; 33, p. 379, and next abstract]. Effective but limited control was obtained by disinfection with sodium benzoate (approximately 4 gm. per kg. raw rubber or 15 gm. for smoked sheets) and using oxalic acid for coagulation instead of formic acid and at $1\frac{1}{2}$ times the usual strength of the latter after having first ascertained that pre-coagulation does not occur at this concentration.

Schoon (G. F.). **Measurements of the susceptibility of raw Rubber to mould.**—*Arch. Rubb. Cult.* (formerly *Arch. Rubbercult. Ned.-Ind.*), 31, 2, pp. 113–131, 1 fig., 3 graphs, 1954. [Indonesian and Dutch summaries.]

From the Foundation Research Institute, Bogor, Java, a method is described for the determination of the growth rate of [unspecified] moulds on sheet rubber [see preceding abstract] as a function of time.

Heavily moulded pieces to be used for producing infection are obtained by keeping six- to 12-day-old sheet or dried films (not smoked or preserved) at 98 per cent. relative humidity in darkness. Two or three samples, 7 by 5 cm., cut from the raw material to be tested, are kept at a constant humidity of 70 per cent., also in darkness, for at least three days. When the water content is constant the samples are suspended above the infected piece in a desiccator jar over a supersaturated calcium sulphate solution. The area covered by mould is estimated daily as accurately as possible. The unit for mould susceptibility, K4, is obtained from the formula $X^4 . \log n^{\frac{1}{y}}$, where X is the number of days, n is 4, and y the percentage area moulded. The mean of the measured values of K4 between 10 and 60 per cent. mould coverage is taken as K4.

Some practical examples of the application of the method are given. During the first two days' storage in the air (at about 27° C. and 70 to 80 per cent. relative humidity) after leaving the smoke-house the mould resistance of raw sheet (K4) drops from 1,200 to 500, then remains constant for a variable period but falls again to 100 after 11 (or sometimes only five) days. Sheets with a K4 value over 500 have excellent mould resistance; those below 100 are unsatisfactory.

Sodium benzoate in combination with oxalic acid [loc. cit.] was definitely inferior as a fungicide to paranitrophenol [*R.A.M.*, 33, p. 255] at 0·35, 0·7, or 1 gm. per kg. sheet rubber. Of intermediate efficacy was rosin-amine-D-pentachlorophenate emulsion added during coagulation at concentrations of 2·1, 3·3, 4·7, or 5·6 gm. per kg.

Norton (D. C.). **Fusarium root rot of Guayule.**—*Plant Dis. Reptr*, 38, 7, pp. 500–501, 2 figs., 1954. [Multilithed.]

Fusarium solani caused wilting of nine-month-old nursery plants of guayule [*Parthenium argentatum*: cf. *R.A.M.*, 26, p. 168] in southwest Texas in 1951, and of two-year-old non-irrigated plants in 1952 and 1953. So far the disease is of minor importance.

Sometimes the entire plant was killed, or wilting affected the branches on one side only; a brown to reddish-brown discoloration spread through the internal root tissues. These symptoms were reproduced in the greenhouse by burying cultures of the fungus on sterilized oats against guayule tap roots. Only a few of the inoculated plants wilted, however, and these bore insect punctures on the roots. It is suggested that such injuries may facilitate entrance of the fungus or weaken the host.

Nicot (Jacqueline). **Remarques sur la microflore fongique de quelques sols de grande culture en Afrique tropicale et à Madagascar.** [Notes on the fungal microflora of some soils under large-scale cultivation in tropical Africa and in Madagascar.]—*Rev. Mycol.*, 18, *Suppl. colon.* 2, pp. 88–93, 1953. [Received September, 1954.]

A study of specimens of soil from oil palm plantations in the Sibiti area of the French Congo, from areas bearing wild or cultivated coffee in the Ivory Coast (Gagnoa and Bouaflé), and from vanilla plantations at Antalaha, Madagascar, indicated that all the regions concerned have a constant, fundamental, widely distributed fungus flora consisting essentially of Mucorineae (associated with soils rich in organic matter), *Penicillium* spp., *Aspergillus* spp. (characteristic of hot climates), *Trichoderma viride*, Dematiaceae, especially *Cladosporium herbarum*, and *Gliocladium roseum*.

In cultivated soils this basic microflora is modified by the presence of species of less saprophytic character, in particular by numerous species of *Fusarium* [see next abstract] and of Dematiaceae. There is a striking similarity between the *F.* spp. and varieties found in the three areas and beneath the three crops; nearly all belong to the sections *Elegans* and *Martiella*. Isolates from the oil-palm plantations included *F. bulbigenum* and its var. *tracheiphilum* and *F. vasinfectum*; from diseased vanilla plantations [cf. *R.A.M.*, 33, p. 183] *F. oxysporum*, *F. bulbigenum*, *F. b.* var. *tracheiphilum*, *F. javanicum* [33, p. 758] and its var. *radicicola*, and *F. solani* var. *minus* [loc. cit.]; and from plantations of diseased or dead coffee, *F. oxysporum*, *F. bulbigenum*, *F. solani* [loc. cit.], *F. vasinfectum*, *F. javanicum*, and *F. decemcellulare*.

These observations support Garrett's views [29, p. 420] on the importance of the soil microflora in the etiology of certain diseases of cultivated plants.

Sadasivan (T. S.) & Subramanian (C. V.). **Recent advances in the study of soil-borne Fusaria.**—*J. Indian bot. Soc.*, 33, 3, pp. 162–176, 1954.

In this critical review of the recent literature (three pages of references) dealing with soil-borne plant pathogenic species of *Fusarium* [see preceding abstract], special attention is paid to the work carried out in India [*R.A.M.*, 32, p. 624; 33, pp. 259, 692], most of which has been noticed in this *Review*. It is concluded that future lines of investigation will aim at elucidating the physiological relationships of the wilt organisms and the host *in vivo*.

Thrower (L. B.). **The rhizosphere effect shown by some Victorian heathland plants.**—*Aust. J. Bot.*, 2, 2, pp. 246–267, 1 diag., 1954.

A study of the fungus flora of a heath soil of Frankston, Victoria [see following abstracts], and of the rhizosphere soils of selected plant species in the area during the period July, 1951, to October, 1952, resulted in the isolation by various methods of 115 species representing 45 genera. The rhizosphere effect was investigated by estimating the R/S ratios, i.e., the number of organisms per gm. rhizosphere soil compared with the number per gm. free soil. The ratios varied from 0·6 to 9·7. The root areas were dominated by *Penicillium* and *Fusarium* [cf. preceding abstracts]. Amongst the more interesting species isolated were *Byssochlamys fulva* [cf. *R.A.M.*, 16, p. 232] and *Amphichaeta grevilleae* [34, p. 67]. Common to both zones were 52 species; 27 came from the rhizosphere only, and 25 from the soil only.

McLennan (Ethel I.) & Ducker (Sophie C.). **The ecology of the soil fungi of an Australian heathland.**—*Aust. J. Bot.*, 2, 2, pp. 220–245, 4 pl., 1 fig., 2 graphs, 1954.

In an investigation of the distribution of fungi in a poor, sandy, heath soil in Frankston, Australia [see preceding and next abstracts], by the dilution plate

method, atypical results were obtained in that the B horizon showed a comparable fungal population (in both numbers and kind) with the A_1 layer. This is attributed to the high organic-matter content in the ortstein layer. Over two years, 107 species were isolated of which *Mortierella ramanniana* [*Mucor ramannianus*: cf. *R.A.M.*, 12, p. 242 and next abstract] was the most common, occurring 331 times out of 415 isolations from the A horizon, 398 times out of 446 in the B, and 8 out of 22 in the C. The dominant genus was *Penicillium* [32, p. 450], occurring 68, 25, and 9 times in the A, B, and C horizons, respectively. Apart from three undescribed species of *Aspergillus*, all the fungi found had been recorded from the northern hemisphere.

McLennan (Ethel I.) & Ducker (Sophie C.). **Micro-fungal population of acid sandy podsols.**—*Nature, Lond.*, 174, 4440, pp. 1060–1061, 1954.

The authors direct attention to the remarkable similarity between the composition of the microfungal population of some acid sandy podsol soils in England [*R.A.M.*, 33, p. 369] and in Victoria, Australia [see preceding abstracts], associated with the presence in the B-horizon of the former of what is described as an 'iron pan'. In the Australian podsol B-horizon there is only a trace of iron, the characteristic dark colour being due to abundant organic matter. In both countries *Mucor ramannianus* [loc. cit.] predominates and, in Australia, formed 98 per cent. of the B-horizon population in one experiment or 86 per cent. when all the samplings were considered. The species list given in the profile tables for the English soil applies equally to the Australian profiles.

Vaartaja (O.). **Microflora on the surface of seedlings as affected by thiram.**—*Bi-m. Progr. Rep. Dep. Agric. Can.*, 10, 4, p. 3, 1954.

When the root collars of apparently healthy seedlings of two strains each of white spruce [*Picea glauca*], Colorado spruce [*P. pungens* var. *glauca*], Scots pine [*Pinus sylvestris*], and *Caragana*, grown in soil drenched with thiram (0·5 gm. per sq. ft.), were rinsed, surface-sterilized, and plated on Bacto agar, the incidence of fungi was 10 per cent. in the 40 platings and bacteria 78 per cent., the corresponding figures for 38 platings of root collars from untreated soil being 76 and 42 per cent. Three representative strains of the bacteria partially inhibited the growth of pathogenic strains of *Rhizoctonia solani* (*Corticium praticola*) [*R.A.M.*, 33, p. 722] and *Pythium* sp.

Almost all the fungi isolated were saprophytic, though the most frequent were strains of *Fusarium oxysporum*, some of which were occasionally slightly pathogenic to Jack pine [*P. banksiana*] and *Caragana* seedlings grown in tubes on mineral salt agar, though the bacteria were not.

These results support Richardson's hypothesis that the change in the soil flora induced by applications of thiram may exert an indirect protective action against damping-off in addition to the direct effect of the fungicide [33, p. 754].

Tresner (H. D.), Backus (M. P.), & Curtis (J. T.). **Soil microfungi in relation to the hardwood forest continuum in southern Wisconsin.**—*Mycologia*, 46, 3, pp. 314–333, 6 graphs, 1954.

A tabulated account is given of the soil microfungi considered as community members of upland hardwood forests in southern Wisconsin, the purpose of the investigation being to determine the relationships existing between the microorganisms and the cover of higher plants. The dominant trees in the 13 stands studied were *Quercus macrocarpa*, the most pioneer species, *Q. alba*, *Q. rubra*, and *Acer saccharum*, the most climax. A 'continuum index' indicated the position of any given stand along the gradient ranging from pioneer forest to climax forest.

Soil samples, collected from the different horizons at regular intervals along a

transect through a representative part of each tract, were analysed by the dilution plate method, using a hard soil extract agar (3 per cent. agar; pH 4·5). Frequency per cent. (the percentage ratio of the number of samples of occurrence to the total number of samples) and density (percentage ratio of the total number of cultures of a species to the total number of cultures of all species) of the principal fungus species were computed; the sizes of the accompanying populations of bacteria and actinomycetes were also determined. Only those species were considered which ordinarily showed a frequency of 50 per cent. or more or were found in four or more sampling areas. About 75 fungus species met these requirements. When the average frequencies of these species were plotted along the gradient of the forest continuum, the range over which a species was distributed and the point of its optimum development (apex of frequency) were revealed. *Spicaria violacea* and *Penicillium nigricans* were typical climax species; *P. janthinellum*, *Mucor ramannianus* [see above, p. 180], and *Oospora sulphurea* were pioneer species; and *P. granulatum* was intermediate. The restricted ranges of *P. janthinellum*, *P. nigricans*, *M. angulisporus*, and *S.* sp. (14–13) made them valuable as sensitive indicators of certain soils.

Relative density either defined the optimum range more sharply or confirmed that shown by frequency. The number of species of microfungi increased from the pioneer towards the climax end of the continuum, the greatest number occurring in stands preceding the climax. There was a progressive increase of *Penicillium* spp. in this direction, but the reverse was true for the Mucorales. *Aspergillus* spp. were scarce in all the soils.

The size of the soil populations was closely correlated with the moisture and organic matter in the soil. The numbers of bacteria and fungi were not greatly affected by soil temperature, but actinomycetes were more numerous in summer than in winter. Species most commonly found in the surface layers were also present throughout most of the profile, though at the lowest depths (23 in.) they were replaced to some extent by a few undetermined slow-growing species.

The results indicate that, as with the higher plant cover, the forest soil microfungi do not exist in discrete communities in which particular species are consistently associated, but form a series of progressively changing species combinations along the gradient of the forest continuum. The results agree with those of Warcup [*R.A.M.*, 31, p. 141 *et passim*] in suggesting that qualitatively, at least, populations of microfungi in the soil of undisturbed areas probably do not fluctuate greatly through the year. Both studies indicate, however, that the character of these populations varies considerably from one ecological area to another, and that the distribution of the different species is influenced by the higher plant cover, the amount and kind of organic matter present, and other factors.

The significance of the present work is considered to be in the new approach to the study of the ecology of soil organisms: the sampling sites were defined with great precision in relation to the higher plant cover, and the methods adopted in taking and treating the samples were such that the data could be analysed quantitatively.

Atkinson (R. G.). **Quantitative studies on the survival of fungi in five-year-old dried soil cultures.**—*Canad. J. Bot.*, 32, 5, pp. 673–678, 1 pl., 1954.

Of 51 dried soil cultures of fungi isolated in 1948 from soil samples from Ancaster, Ontario, only 12, representing seven of the 32 genera cultured, were viable after five years [cf. *R.A.M.*, 33, p. 399]. Platings on oxgall-amended potato dextrose agar [33, p. 380] revealed extreme variations in the viability of the surviving fungi. It was very high in cultures of *Rhizopus nigricans* [*R. stolonifer*], *Aspergillus fumigatus*, *A. sydowi*, *A. ustus*, *Chaetomium indicum*, and *C. spirale*; these were followed (in descending order) by *Fusarium oxysporum* var. *redolens*, *Circinella*

spinosa, and *Penicillium janthinellum* [see preceding abstract]. The least viable cultures, though not dead, were those of *P. purpurogenum* and two isolates of *F. oxysporum*. Among the non-viable were *Alternaria tenuis*, *Botrytis cinerea*, *Cephalosporium acremonium*, *Cladosporium herbarum*, *Coniothyrium fuckelii*, *Geotrichum candidum*, *Myrothecium roridum*, and *M. Verrucaria*.

Bell (J. E.). **Molybdenum responses in the Auckland Province.**—*N.Z. J. Agric.*, 89, 1, pp. 85–86, 2 figs., 1954.

The author indicates the different types of soil in Auckland, New Zealand, on which applications of molybdenum [cf. *R.A.M.*, 33, p. 608] have resulted in improved pasture. Quite good results have been obtained in the hill country in the north, even in the absence of phosphate, lime, and potassium, though better results generally are secured in conjunction with these fertilizers than from molybdenum alone. It is expected that much declining pasture will be improved.

Leach (W.) & Taper (C. D.). **Studies in plant mineral nutrition II. The absorption of iron and manganese by Dwarf Kidney Bean, Tomato, and Onion from culture solutions.**—*Canad. J. Bot.*, 32, 5, pp. 561–570, 1954.

At the Department of Botany, University of Manitoba, Winnipeg, experiments in which plants of dwarf kidney bean (*Phaseolus vulgaris* var. *humilis*) and Vetomold 121 tomato were grown in complete nutrient solutions containing various concentrations of iron and manganese [*R.A.M.*, 30, p. 626; 33, p. 755] demonstrated that in order to avoid deficiency symptoms the iron : manganese ratio should be within the range 1·5 to 3 for bean and 0·5 to 5 for tomato. Concentrations below the minimum always produced deficiency symptoms irrespective of this ratio. Leaf analyses of both plants revealed an apparent antagonism between the absorption of the two elements. It also occurred with onions grown in solutions containing only iron and manganese sulphates, but the combined absorption of the two metals remained virtually unchanged irrespective of their initial ratios. Although this suggests that there should be some degree of interchangeability between the functions of iron and manganese, the fact that there is none was clearly demonstrated by the experiments in which deficiency symptoms were produced.

Greenaway (S.). **Notes on the hot-water treatment of Cane setts in the Mackay district, 1953.**—*Proc. Qd Soc. Sug. Cane Technol., 1954*, pp. 201–205, 1954.

The equipment and methods used in three large-scale hot-water-treating plants for the control of sugar-cane ratoon stunting [virus] disease in Queensland [*R.A.M.*, 33, p. 503; cf. 34, p. 64, and next abstract] are critically reviewed. There were three sizes of tank, holding enough plants, respectively, for two, one, and one-third acres. Smaller baskets appear to be more satisfactory than larger (2 by 2 by 3 ft.). All material was also treated with baytan, an organic mercurial, at 0·1 per cent. [loc. cit.]. The tanks were found to require emptying and replenishing at intervals of not more than five days. It is suggested that though the results were satisfactory, the equipment could be improved. Good germination, growth, and stooling can be expected after treatment if cane of a suitable type is planted quickly in reasonably favourable soil conditions and lightly covered. The most important factor in poor germination was poor soil drainage.

Hughes (C. G.). **The year 1953 in Queensland Sugar-Cane pathology.**—*Proc. Qd Soc. Sug. Cane Technol., 1954*, pp. 207–213, 4 figs., 1954.

The year 1953 was an outstanding one in the history of sugar-cane disease in Queensland, with regard to control [see next abstract]. The State, instead of being one of the worst areas for sugar-cane diseases, has become one of the healthiest. The initiation of clean-seed schemes on a commercial scale [see preceding abstract]

is of great importance. In the Inkerman district alone sufficient setts for over 250 acres were given hot-water treatment against ratoon stunting [virus] disease [loc. cit.], providing enough healthy cane for the 1954 planting. Because of the possibility of attacks by rotting organisms as the result of prolonged heating, it was considered advisable to add 3 per cent. organic mercury compound (1 lb. per 100 gals.) to the hot bath or to use it cold at five times the strength for dipping the setts after the hot water. It remained effective for nearly three weeks.

The mercurial bath or spray combined with the cutter planter continued to be used widely for the control of pineapple disease [*Ceratocystis paradoxa*: *R.A.M.*, 32, p. 101].

A species of (?) *Verticillium*, not previously reported on sugar-cane, was responsible for considerable losses on individual farms, particularly in the South Kalkie area at Bundaberg in 1952 and 1953. The fungus, which attacks many commercial varieties, is associated with early cutting, and was shown by inoculation to be an active cane parasite. Fungicides and methods used against other *Verticillium* diseases may be effective in control.

King (N. J.). **The overall disease position.**—*Cane Gr. quart. Bull.*, 16, 2, pp. 60–62, 1952.

In this address to the Annual Conference of the Queensland Canegrowers' Association, the author briefly reviews the sugar-cane disease situation in Queensland [see preceding abstract], stating that the gumming disease [*Xanthomonas vasculorum*: *R.A.M.*, 31, p. 352] is now non-existent and any future outbreaks are likely to be of minor importance and easily controlled. As a result of an energetic campaign based on inspection, destruction of diseased stools, plough-out orders, and varietal control, conducted by the Bureau and the Cane Pest and Disease Control Boards, downy mildew [*Sclerospora sacchari*: 34, p. 107] has been completely eliminated. Fiji [virus] disease [33, p. 51] was not recorded in the Childers and Maryborough areas and has been almost completely eradicated from Bundaberg, Moreton, and Rocky Point. Leaf scald [*X. albilineans*: 34, p. 107] and chlorotic streak [32, p. 100] are still persistent, particularly in the far north, as no well-planned campaign has been developed against them. It is hoped, however, that the Boards will soon deal with them and that particular care will be taken to use clean plants in the fields and never those from a block known to be diseased.

In one trial at Moreton healthy cane yielded 54 tons per acre compared with 38 tons per acre for chlorotic streak material. Similar results, though not so striking, were obtained in trials with other diseases. Clean seed projects are the nucleus of a control programme.

Power spray equipment.—*Cane Gr. quart. Bull.*, 16, 2, pp. 75–76, 1 fig., 1952.

A description is given of a power spray equipment used in sugar-cane fields at the Bundaberg Experiment Station, Queensland. It consists of a 60-gal. container mounted on a light angle-iron platform bolted to a Farmall A. V. Tractor, and a 3 ft. standard with booms attached, welded and braced at the rear of the platform. The boom is adjustable to any height and has a few movable parts which are easily attached to and removed from the tractor. The pump is worked from the tractor power take-off. The spray nozzles can be adjusted to spray in any horizontal direction. Travelling at 2·1 miles per hour it was possible to apply, through small nozzles, 21 gals. per acre and to cover 6 acres per hour.

Luke (H. H.) & Connell (T. D.). **Studies on antibiotic soil organisms. II. Bacteria and fungi antagonistic to Pythium arrhenomanes in Sugarcane soils of Louisiana.**—*Phytopathology*, 44, 7, pp. 377–379, 1954.

The fungi isolated in this study have been considered briefly elsewhere [*R.A.M.*,

32, p. 400]. Of 5,648 [unspecified] bacterial isolates from the various soil types, tested *in vitro*, about 3·6 per cent. exerted an antibiotic action on *Pythium arrhenomanes*, the agent of sugar-cane root rot in Louisiana [cf. 29, p. 583; 33, p. 667]. Gauged by the width of the zones of inhibition produced, the fungi were more antagonistic than the bacteria. The largest bacterial populations were obtained from soils with pH values exceeding 7·6, whereas fungi were most numerous in those with an acid reaction and exercised their maximum antibiotic influence between 6·1 and 7, with an optimum at 6·9. The bacteria were most active under soil conditions which were unfavourable to infection by *P. arrhenomanes*.

Dignadice (P. B.) & Orillo (F. T.). **Yellow leaf spot of Sugar Cane.**—*Philipp. Agric.*, 37, 1–2, pp. 36–49, 2 figs., 1953. [Received September, 1954.]

Yellow leaf spot of sugar-cane caused by *Cercospora koepkei* [*R.A.M.*, 18, p. 626] is generally of minor importance but may be more serious on susceptible varieties during cool, showery weather and cause appreciable reductions in tonnage and sugar yield. As the disease is endemic in all sugar-cane regions of the Philippines, studies on its biology were made from December, 1951, to February, 1953, in the Department of Plant Pathology and the Central Experiment Station, College, Laguna.

The symptoms are irregular, pale to bright yellow spots which later develop red dots. Under favourable conditions the under surface of the leaf is covered with a white to grey mycelium. Eventually the spots coalesce to form large, irregular reddish patches which may cover the entire blade, including the midrib. The spots are generally more conspicuous and numerous on the older leaves than the upper ones. Finally the leaf dies prematurely.

The pathogen would not grow in culture on artificial media. The conidia remained viable for only two to four weeks. Although the relevant measurements, conidiophores 38·7 to 65·1 by 3·5 to 7 μ and conidia 22·8 to 45·7 by 5·2 to 7 (average 36·7 by 6·7) μ, differed slightly from those of Saccardo the symptoms agree closely with those of *C. koepkei*. Pathogenicity was established by spraying healthy plants with a spore suspension and inoculating sterilized soil planted with healthy canes.

The varieties POJ 2878, College 39, H37–1933, H32–8560, POJ 2961, POJ 2883, and POJ 3016 were severely infected both in the laboratory and in the field; POJ 2714, M 1900, PSA 132, and PSA 76 were moderately susceptible, and F 108, F 109, and Alunan slightly so. POJ 3016 also appeared to be highly susceptible on the basis of field observations alone. In cross-inoculation experiments with common weeds growing near sugar-cane crops *Saccharum spontaneum* was the only susceptible species.

Incidence and severity are apparently associated with available moisture. Infection is believed to occur through the stomata of uninjured leaves, insect punctures, and wounds incurred during cultural operations. The fungus is disseminated by such agents as wind, insects, and rain splashes and survives from one season to the next as dormant mycelium within the infected trash. Suggested control measures include burning the trash after harvest, draining excess water in the field, destroying *S. spontaneum* in the vicinity of cane fields, and planting the least susceptible varieties. In preliminary spraying experiments in the laboratory 0·4 per cent. spraycop and 0·2 per cent. ferbam (fermate) controlled the disease completely [cf. 33, p. 52]. However, field trials are needed before these sprays can be definitely recommended.

Talbot (P. H. B.). **Micromorphology of the lower Hymenomycetes.**—*Bothalia*, 6, 2, pp. 249–299, 20 figs., 1954.

The morphology of the basidia, hymenial texture, basidiospores, chlamydospores, hyphae, cystidioles, cystidia, setae, and mineral inclusions in the lower Hymeno-

mycetes is reviewed in great detail [*R.A.M.*, 33, p. 382], examples from other groups of fungi being cited as well. It is concluded that Linder's terminology for the basidium is over-simplified and unacceptable, while Neuhoff's terminology (*Bot. Arch.*, 8, pp. 250–297, 1924), based on homologies, is likewise unacceptable. The author agrees with M. A. Donk (Revisie van de Nederlandse Heterobasidiomycetae en Homobasidiomycetae Aphyllophoraceae. Deel I, Wageningen, 1931; Deel II, Amsterdam-Haarlem, 1933) that the place or stage of karyogamy and of meiosis are fundamentals which should be used in formulating a terminology for basidia. M. A. Donk's new term 'protosterigma' (the part of the sterigma below the apical spiculum) is published here for the first time.

Talbot (P. H. B.). **The genus Stereum in South Africa.**—*Bothalia*, 6, 2, pp. 303–338, 23 figs., 1954.

This revision of the collections of *Stereum*, all of which are described, in the National Herbarium, Pretoria, is supplemented by a key for the determination of 22 species which are accepted by the author as true species for South Africa, out of the 67 recorded names. Fructifications of *S. purpureum* [*R.A.M.*, 33, p. 658] appear to be rare in South Africa. *S. sanguinolentum* is suspected to be responsible for a serious disease of *Pinus taeda* in Northern Natal.

Cash (Edith K.). **An index to C. L. Shear's Mycological Notes I-IX.**—*Mycologia*, 46, 3, pp. 367–371, 1954.

The genera and species of Ascomycetes and Fungi Imperfecti mentioned in C. L. Shear's Mycological Notes I–IX [*R.A.M.*, 16, p. 775; 18, p. 628; 20, p. 497; 23, p. 43; 28, p. 404] are herein indexed to facilitate reference.

Lowe (J. L.). **Perennial polypores of North America. II. Fomes with coloured context, hyaline spores.**—*Mycologia*, 46, 4, pp. 488–498, 1954.

Continuing his earlier work [*R.A.M.*, 32, p. 47], the author presents descriptive notes (with a key to the species) on North American species of *Fomes* with coloured context and hyaline spores. The paper considers 59 species and recognizes 17.

Wehmeyer (L. E.). **Studies in the genus Clathrospora.**—*Mycologia*, 46, 4, pp. 498–522, 19 figs., 1954.

Descriptive notes are given on six species of *Pleospora* [*R.A.M.*, 33, p. 322], including one new combination, and 11 of *Clathrospora* [32, p. 102], including three new species and two new combinations, the treatment being designed to bring out the inter-relationships of three rather distinct groups of species with flattened, muriform ascospores, comprising, respectively, variations of certain established species of *Pleospora*, species deriving from *C. permunda*, and those centred about the type species, *C. elynae*.

Pantidou (Maria E.) & Korf (R. P.). **A revision of the genus Keithia.**—*Mycologia*, 46, 3, pp. 386–388, 1954.

A re-examination of the five described species of *Keithia* at the Department of Plant Pathology, Cornell University, showed that all except *K. juniperi* [*R.A.M.*, 15, p. 69] conformed to the original concept of the genus. In this species, however, the carbonaceous ascocarp develops above the epidermis [of *Juniperus* spp.]; hyphae growing between the epidermis and the palisade layer penetrate to the surface and produce the fruit body on a narrow base. The ascocarp consists of stromatic tissue, differentiated into a hyaline interior and a dark-walled outer layer or layers of cells. The four typical species of *Keithia* have the unitunicate asci typical of the Discomycetes; they are cylindrical to clavate and parallel, forming

a palisade layer interspersed with apically free, true paraphyses. In *K. juniperi* the asci are broadly clavate and bitunicate [cf. 30, p. 583]; the outer wall ruptures and the inner extends before liberating the spores. The asci arise from a hemispherical stromatic cushion at the base of the ascocarp and diverge radially outwards. Two types of interthecial threads were noted: narrow, thin-walled, and hyaline, and broader, thick-walled, and brown.

It is concluded that *K. juniperi* is not a Discomycete. As a specimen of *Dothidea sphaeroidea* was found to be essentially identical with the type specimen of *K. juniperi*, and both specimens matched the description of *Coccodothis sphaeroidea*, it is concluded that *K. juniperi* should be treated as a synonym of *C. sphaeroidea*.

Karling (J. S.). **Host reaction, host-parasite relationship, hosts, and taxonomic criteria in Synchytrium.**—*Mycologia*, 46, 3, pp. 293–313, 1954.

After a detailed historical résumé (51 references) of the differences in reports and viewpoints on host reactions and in the relative value of various taxonomic criteria, the author concludes that the exact identification and classification of *Synchytrium* species [*R.A.M.*, 33, p. 688] does not present special difficulty, except lack of knowledge. Of 140 or more described species, fewer than 30 are fully known and the identity of most of the remainder is based on incomplete data. The author enumerates the features requiring elucidation in particular life-histories and host ranges.

Schmitt (J. A.). **New and unreported species of hosts for Erysiphe cichoracearum DC.**—*Plant Dis. Reptr*, 38, 8, p. 563, 1954. [Multilithed.]

An expanded account of this work carried out in Michigan has already been noticed from another source [*R.A.M.*, 34, p. 108].

Muller (A. S.), Jenkins (Anna E.), & Bitancourt (A. A.). **Elsinoe and Sphaceloma in Florida.**—*Plant Dis. Reptr*, 38, 8, pp. 599–601, 1954. [Multilithed.]

Collections of species of *Elsinoe* and *Sphaceloma*, including *E. jasmini* on *Jasminum heterophyllum* and *J. humile*, *S. punicae* on pomegranate [*R.A.M.*, 31, p. 131], *S. lippiae* on *Lippia nodiflora*, and *S. viburni* on *Viburnum obovatum*, all new to Florida, are tabulated. The first two are also new records for the United States.

Lamb (J.). **Studies in blister blight control XVI. Conclusion.**—*Tea Quart.*, 25, 2, pp. 14–16 [38–40], 1954.

The author reviews the progress achieved in the control of tea blister blight [*Exobasidium vexans*] in Ceylon during the past few years, particularly in the course of the experiments described in this series of articles [*R.A.M.*, 34, p. 68]. Future work under the auspices of the Tea Research Institute will be concerned with major practical possibilities, such as the eventual use of systemic fungicides, which will require prolonged and detailed investigation. However, it will be several years before the present recommended equipment and fungicides are likely to be much improved upon, though organization and supervision may need watching. The experiments have clearly demonstrated the efficiency of wet spraying from a knapsack sprayer for long-term protection and hand dusting for shorter-term in areas not subject to prolonged blight attacks. Mist blowing requires adequate supervision and maintenance.

On the basis of established facts the order of probability in explanations for unsatisfactory results is: inefficient spraying, supervision, and organization (including mixing and dispersion of fungicide before spraying), imperfect nozzles, and unsatisfactory fungicides, especially those affected by deterioration through bad storage.

Schlegel (D. E.) & Rawlins (T. E.). **Inhibition of Tobacco mosaic virus by an antibiotic from an actinomycete, Nocardia species.**—*Phytopathology*, 44, 6, pp. 328–329, 1954.

The most effective of the antibiotics so far tested at the Department of Plant Pathology, University of California, Berkeley, for the inhibition of tobacco mosaic virus multiplication in floating leaf disks [cf. *R.A.M.*, 33, pp. 387, 585] is a purified preparation of MK 61, an antibiotic from *Nocardia* (?) *formica* described by H. B. Woodruff (*Proc. int. Congr. Microbiol.*, Rome, 1953). Its efficiency appears to be relatively independent of changes in host composition induced by light, suggesting that its inhibitory effect may be exerted directly on the virus rather than on the metabolism of the plant.

Bercks (R.). **Untersuchungen über Änderungen des Virusgehaltes in Tabakpflanzen während der Vegetationsperiode.** [Studies on changes in the virus content of Tobacco plants during the growing period.]—*Phytopath. Z.*, 22, 2, pp. 215–226, 5 graphs, 1954.

After the inoculation of tobacco plants with potato virus X, the virus content of the leaves rose at first, reaching a maximum more or less rapidly according to the prevailing environmental conditions. A progressive decrease soon followed in the older foliage, whereas a fairly high titre was maintained in the younger leaves. Another rise occurred at flowering time, succeeded by a general fall. There was no difference between the virus contents of sap expressed from older leaves by means of pressure pincers or a homogenizator [*R.A.M.*, 31, p. 149], but appreciably more virus was obtained from the young leaves of old plants by the latter method.

Lucas (G. B.) & Person (L. H.). **Factors influencing oospore germination in Peronospora tabacina.**—Abs. in *Phytopathology*, 44, 6, p. 332, 1954.

Oospores of *Peronospora tabacina* in dried, infected tobacco leaves, after four months' exposure to weekly alternating temperatures of 50° and 68° to 78° F., germinated after about a month on moist soil at North Carolina State College, Raleigh [*R.A.M.*, 33, p. 505]. Some of them produced sessile sporangia. Similar germination occurred after 20 months' storage. Sporangia were not formed from oospores in water or dry soil but they developed on moist soil at 55°, 65°, and 75°. From the regularity of their formation and attachment to the oospores it seems possible that such sporangia are normal products of oospore germination in *P. tabacina*.

Lucas (G. B.) & Todd (F. A.). **Resistance to black shank of certain flue-cured Tobacco varieties in seedling and transplant stages.**—*Plant Dis. Reptr*, 38, 7, pp. 502–504, 1 graph, 1954. [Multilithed.]

In experiments conducted by the Plant Pathology Section, North Carolina State College, and the United States Department of Agriculture, seven varieties and strains of tobacco were tested for resistance to black shank (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, 32, p. 217]. Seedlings (100 per 4-in. pot) at the two- to four-leaf stage were inoculated by pouring a zoospore suspension over them and kept for three to four days at 30° C. with continuous daylight fluorescent illumination. At the transplant stage (two to three weeks) single potted plants were inoculated by placing a small piece of an agar culture, or pouring a zoospore suspension, into a hole 1 in. deep in the soil near the base. Strain T × L [loc. cit.] was immune to this method of inoculation; Oxford 3, Dixie Bright 101, and Dixie Bright 102 were more resistant at the transplant than at the seedling stage, the last two being more resistant at the transplant stage than Oxford 3. In plant bed tests on black-shank infested soil the two Dixie Bright strains remained disease-free over a three-year period, while in some plots all plants of the susceptible 400 variety were killed.

Riley (E. A.). **Anthracnose : a serious disease of Tobacco nurseries in Northern Rhodesia caused by Colletotrichum tabacum Böning.**—*Trop. Agriculture, Trin.*, 31, 4, pp. 307–311, 2 figs., 1954.

Tobacco anthracnose (*Colletotrichum tabacum*) has been present in nursery beds in Northern Rhodesia [*R.A.M.*, 33, p. 410] since 1949, though mistaken for an aggravated form of damping-off. It spread rapidly, frequently reaching epidemic proportions on both Virginia and Turkish varieties.

First dull green, watersoaked spots (2 to 3 mm., later enlarging to 10 mm. in diameter) appear on the seedling leaves close to the soil; they then turn pale brown and often have a darker brown border. Very small seedlings may be killed off. Later, numerous pin-point spots with light brown to white centres develop, usually on larger seedlings, resulting in unequal growth, puckering, and distortion of the leaves, which become ragged and torn. Deep, dark brown, longitudinal lesions appear on the young stems and petioles and also on the midribs which often break at the points of infection, leaving the leaf hanging downwards. On field plants leaf spotting is less intense but stem attacks are unusually severe, causing deep, broad cracks and bands (at soil-level) which girdle the stems and kill the transplants. So far, no infection of flower or seed capsule has been observed. The pathogen was found by experiment to be soil-borne [cf. 11, p. 753] and as sporulation is profuse it is probably wind-borne also.

In culture the fungus favoured alkaline media and grew well at pH 9. Infection is more common on low-lying sites than on higher ground with better air circulation. Although no definite control of the disease was obtained, Bordeaux mixture (4:4:50) checked sporulation. It is probable that the disease could be controlled by some form of soil disinfection in addition to protective spraying.

Burtsev (Y. A.). К вопросу сортового районирования Махорки в колхозах Украинской ССР. [On the problem of varietal distribution of Mahorka on farms in the Ukrainian S.S.R.]—Табак [*Tobacco*], 15, 3, pp. 19–20, 1954.

As a result of a recent search for disease resistance in mahorka tobacco in the Ukraine, the variety Vuisokoroslaya Zelenaya 317, resistant to tip chlorosis [*R.A.M.*, 33, p. 764] and wildfire [*Pseudomonas tabacum*: 20, p. 86], is recommended for cultivation in the northern, north-western, and central mahorka-growing regions of the Republic. The new variety Vuisokoroslaya 12/12, highly resistant to wildfire but less so to tip chlorosis, is suitable for southern districts, and Egiza 1549 and MP–12, both fairly resistant to tip chlorosis, for central and southern regions, respectively.

Finlay (K. W.) & Parker (C. A.). **The preservation of Tomato spotted wilt virus by vacuum drying.**—*J. Aust. Inst. agric. Sci.*, 20, 2, pp. 112–114, 1954.

Experiments were conducted at the Institute of Agriculture, University of Western Australia, to investigate the possibility of preserving tomato spotted wilt virus dry in the absence of oxygen [*R.A.M.*, 32, p. 648]. The apparatus used was a modification of that described by Greaves (*Rep. med. Res. Coun. Lond.* 258, 1946). An extract of affected tomato leaves in phosphate buffer at pH 7 plus sodium sulphite (0·4 ml. of 1:10 inoculum) was placed in each ampoule and evacuated. After five to six hours' drying the ampoules were sealed under vacuum and stored. The dried material was reconstituted by the addition of three to four drops of the original buffer solution. When as much as possible had dissolved, the resultant fluid was inoculated to *N. glutinosa*.

Dried sap was uninfective, but when the infective sap was mixed with 25 and 50 per cent. fresh egg albumen infectivity survived drying. When mixed with 25

per cent. egg albumen plus 1 gm. per ampoule of phosphorus pentoxide the virus retained its infectivity during storage for 21 months at room temperature.

As the symptoms produced on *N. glutinosa* after 21 months' storage appeared to be identical with those recorded for the original sap, it would seem that all strains in the original material survived the treatment.

Bewley (W. F.). **Virus-free seeds and the Tomato grower.**—*Rep. int. hort. Congr.*, 13 (*1952*), pp. 1016–1018, 1953. [French summary.]

It has been demonstrated at the Cheshunt Research Station that tomato plants from virus-free seed [*R.A.M.*, 32, p. 609; 33, p. 655] may be grown and kept free from infection through the whole of their life. As a result of this work, tomato growers formed a limited company in 1938 to provide themselves with virus-free seeds. Since then no serious complaints have been received with regard to the seeds [cf. 32, p. 402]. It has been repeatedly observed in tomato nurseries where virus-free seeds are used, and where all the workmen are non-smokers [30, p. 139], that virus diseases do not appear until late in the season, if at all.

Das (C. R.) & Raychaudhuri (S. P.). **A probable strain of Tomato aucuba mosaic virus.**—*Indian Phytopath.*, 6 (*1953*), 2, pp. 116–122, 2 figs., 1954.

During the winter of 1949–50 a mosaic disease affected from 2·7 to 4·5 per cent. of the tomato plants in experimental plots at the Indian Agricultural Research Institute, New Delhi. A detailed study established it to be a strain of tomato aucuba mosaic [strain of tobacco mosaic virus: cf. *R.A.M.*, 33, p. 766], differing from the typical virus in that it withstood heating for ten minutes at 98° C. and produced local necrotic lesions instead of stripe symptoms on leaves of eggplant, mottling and later vein-banding on tobacco, including White Burley, and interveinal mottling on *Solanum nigrum*.

Cook (A. A.). **Reaction of Lycopersicon species to regional isolates of Septoria lycopersici.**—*Phytopathology*, 44, 7, pp. 374–377, 1 fig., 1954.

At the Department of Plant Pathology, South Dakota State College, five- to six-weeks-old transplants of tomato, *Lycopersicon hirsutum*, *L. peruvianum*, *L. pimpinellifolium*, *L. glandulosum*, *L.h.* f. *glabratum*, *L. esculentum* var. *cerasiforme*, *L. p.* var. *dentatum*, and a series of progenies suspected to be hybrids of tomato and *L. peruvianum* were inoculated with eight regional isolates of *Septoria lycopersici* [*R.A.M.*, 24, p. 252; 29, pp. 180, 233]. Of the several criteria used in the evaluation of infection, lesion diameter was found to be the most consistent and dependable for adjudging the relative resistance of the various accessions and the comparative virulence of the individual isolates of the pathogen. The latter were separable into three groups in an ascending scale of virulence, namely, (1) South Dakota (original and sub-isolate); (2) Canada, South Carolina (original), and Indiana (sub-isolate); and (3) Wisconsin, Indiana (original), and South Carolina (sub-isolate). The inconsistent results obtained by investigators using the same accession numbers may be due partly to variation within these accessions, while differences in virulence of the isolates may be a contributory factor. Such variation in pathogenicity should be recognized in evaluating and utilizing resistance.

Diener (U. L.). **Host-parasite relations of the gray leaf spot disease of Tomato.**—Abs. in *Phytopathology*, 44, 6, pp. 331–332, 1954.

The results of histological studies [at the Alabama Polytechnic Institute, Auburn] showed that *Stemphylium solani* [*R.A.M.*, 31, p. 303] invades the tomato leaf primarily through the stomata by means of an infection peg or germ-tube tip. The subsequent development of the pathogen in the tissues is similar, regardless of

the mode of entry. Bulbous primary hyphae arise from the infection hyphae in the substomatal or other subepidermal cavities. Secondary hyphae ramify intercellularly, causing disorganization of the cell protoplasts in the area of the lesion about 60 hours after inoculation. Cellular disintegration occurs in the immediate vicinity of the invading hyphae, with a visible alteration of the cell walls.

Young (P. A.) & Pinckard (J. A.). **Sclerotium rolfsii and its control with chlorobromopropene.**—Abs. in *Phytopathology*, 44, 6, p. 334, 1954.

In 1953 an epiphytotic of southern blight (*Sclerotium rolfsii*), uncontrolled by crop rotation with maize and cotton, destroyed 55 per cent. of 1,748 tomato plants in one acre and 91 per cent. of 1,533 in another near Jacksonville, Texas [*R.A.M.*, 23, p. 503]. The fungus also killed 89 to 100 per cent. of the plants of ten tomato varieties in a yield trial. None of the many tomato species and varieties used in large-scale inoculation tests over a five-year period showed more than slight resistance. In plots measuring 24 sq. ft. in a naturally contaminated sandy field, drenching with chlorobromopropene (1·14 gals., equivalent to 13 lb., in 100 gals. water per 100 sq. yds.) reduced the mortality rate within 15 weeks from 67 to 5 per cent., the figure for a half dose of chlorobromopropene being 14 per cent.

Saperstein (S.) & Starr (M. P.). **The ketonic carotenoid canthaxanthin isolated from a colour mutant of Corynebacterium michiganense.**—*Biochem. J.*, 57, 2, pp. 273–275, 2 graphs, 1954.

Canthaxanthin, recently detected by Haxo (*Bot. Gaz.*, 112, p. 228, 1950) in *Cantharellus cinnabarinus*, proved to be the major ketonic carotenoid pigment obtained at the Department of Bacteriology, University of California, Davis, from an orange-coloured mutant of *Corynebacterium michiganense*, producing relatively mild symptoms on tomato [*R.A.M.*, 33, p. 714].

Conover (R. A.). **Control of bacterial spot of Tomato and Pepper seedlings with agrimycin.**—*Plant Dis. Reptr*, 38, 6, pp. 405–409, 1954. [Multilithed.]

Bacterial spot (*Xanthomonas vesicatoria*) has been serious for many years on tomatoes [*R.A.M.*, 27, p. 313] and [chilli] peppers [28, p. 436] in the vegetable-growing areas along the lower east coast of Florida. Seedlings for autumn and winter crops are particularly affected and when transplanted to the field may suffer considerable losses during heavy rains. In the autumn of 1953 a large-scale experiment was carried out in commercial tomato plant beds to determine the effectiveness of a formulation of agrimycin [34, p. 97], containing 22·2 per cent. streptomycin and 2·2 per cent. terramycin, in controlling the disease. Sprays were repeated at two-day intervals, using a tractor-drawn power sprayer provided with booms. A concentration of 200 p.p.m. streptomycin and 20 p.p.m. terramycin gave excellent control, reducing the average number of infection centres per bed to 2·3, each centre having an average area of 4·09 sq. ft., compared with 14·3 centres of 13·9 sq. ft. for the untreated. In a second block of beds the same spray resulted in 74 per cent. healthy seedlings and only 0·4 per cent. severely diseased, 95 per cent. of the seedlings being suitable for transplanting, compared with 73 per cent. from beds sprayed with a 100:10 p.p.m. dosage, and 27 per cent. from the untreated. None of the treatments caused visible injury to the seedlings.

In a small-scale experiment with chillis, using a compressed-air sprayer, a 300:30 p.p.m. concentration gave effective control.

Riker (A. J.). **Opportunities in disease and insect control through genetics.**—*J. For.*, 52, 9, pp. 651–652, 1954.

The author discusses the importance of breeding trees for resistance to insects and diseases, present both at home and abroad, as well as for other desirable

characteristics and quotes some successful results obtained by other workers in this field.

Georgescu (C. C.) & Petrescu (Mircea). **Un parazit al fructelor de Ulm : Gloeosporium ulmicola-Miles.** [A parasite of Elm fruits: *Gloeosporium ulmicola* Miles.]—*Rev. Pădurilor*, 69, 3, p. 106, 4 figs., 1954. [Russian summary.]

The occurrence of *Gloeosporium ulmicola* is reported for the first time in Europe on leaves and fruits of elms (*Ulmus pumila*) [cf. *R.A.M.*, 30, p. 252] growing in a forest nursery in Rumania. A black stroma envelops one or several acervuli joined together. Seed disinfection with 1 per cent. formalin for ten minutes is recommended.

Koretskaya (Mme Z. M.). Влияние древесных насаждений на микофлору почв в условиях степи. [The influence of tree planting on the soil mycoflora under steppe conditions.]—Микробиология [*Microbiology, Moscow*], 21, 5, pp. 566–571, 1952.

In studies at the Forestry Institute of the Ukrainian S.S.R., Kiev, in 1949 it was found that the surface layer of soil (0 to 3 cm. deep) contained the greatest numbers of fungi, *Penicillium* spp. [*R.A.M.*, 32, p. 696] forming an average of 90 per cent. of the total fungus flora in the woody steppes and 66 per cent. in the grassy steppes, followed by *Aspergillus*, *Rhizopus*, and *Cladosporium* spp. which were considerably more numerous in soils under grass at depths of 5 to 20 cm. As the depth increases the number of fungi decreases, particularly under forest conditions. At great depths (4 to 5 m.) fungi concentrate only round the growing roots of oak trees. From January to September there were comparatively more fungi in the intergrading region than in the open steppes.

Fergus (C. L.). **The effect of temperature and nutrients upon spore germination in the Oak wilt fungus.**—*Mycologia*, 46, 4, pp. 435–441, 1954.

Studies at the Botany Department, Pennsylvania State College, demonstrated that the optimum temperature for the germination of the ascospores and endoconidia of *Endoconidiophora fagacearum* [*Chalara quercina*: *R.A.M.*, 33, p. 694] is within the range of 21° to 32° C., the maximum between 33° and 36°, and the minimum under 3°. The time required for the spores to germinate, the rate of growth of the germ-tubes, and the production of secondary endoconidia were affected by temperature. Morphological changes accompanied spore germination at the different temperatures. At high temperatures the germ-tubes branched earlier, and near the optimum endogenous spores began to form within 16 hours and became globose. High and low temperatures inhibited secondary spore formation even when they did not inhibit germ-tube growth. Germ-tubes from ascospores also produced secondary endoconidia.

Sucrose, glucose, and yeast extract permitted high percentage germination, but the spores also germinated fairly well in rain water and distilled water. Decoctions and infusions of living and dead red oak bark and wood and mixtures of these solutions increased germination.

Himelick (E. B.), Curl (E. A.), & Zuckerman (B. M.). **Tests on insect transmission of Oak wilt in Illinois.**—*Plant Dis. Reptr*, 38, 8, pp. 588–590, 1954. [Multilithed.]

Transmission of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: *R.A.M.*, 33, pp. 454, 509, and next abstract] by *Colopterus truncatus* was reported for the first time in field trials in 1953 in northern Illinois. The beetles had been collected from a mat with both endoconidia and ascospores of high germinability and were caged on a small branch bearing a single knife-cut.

Griswold (C. L.) & Bart (G. J.). **Transmission of Endoconidiophora fagacearum by Pseudopityophthorus pruinosus.**—*Plant Dis. Reptr*, 38, 8, p. 591, 1954. [Multilithed.]

Oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: see preceding and next abstracts] was successfully transmitted by *Pseudopityophthorus pruinosus* [*R.A.M.*, 33, p. 188] at Ohio Agricultural Experiment Station, Wooster, when adult beetles were transferred from cultures of the fungus to three-year-old potted red and pin oaks [*Quercus* spp.]. It is suggested that adult beetles may become infested in nature following the penetration of the fungus into breeding galleries, which are usually found in the smaller branches of infected trees.

Fowler (M. E.). **Oak wilt distribution.**—*Plant Dis. Reptr*, 38, 8, pp. 595–596, 1 map, 1954. [Multilithed.]

Aerial surveys carried out during the summer of 1953 by Federal and State agencies and by private concerns and individuals showed that oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: *R.A.M.*, 32, p. 596 and preceding abstracts] was still confined to the 18 States where it had been reported in previous years, though additional counties were affected within these States.

Boewe (G. H.), Campana (R. J.), & Schneider (I. R.). **Sycamore anthracnose severe in Illinois.**—*Plant Dis. Reptr*, 38, 8, pp. 597–598, 1954. [Multilithed.]

Sycamore [*Platanus* spp.] anthracnose (*Gnomonia veneta*) [*G. platani*: *R.A.M.*, 32, p. 109] was very conspicuous and severe throughout Illinois during the latter half of May, 1954, resulting in partial to complete defoliation of trees of all sizes within one to two weeks from the first appearance of the disease. Trees in rural areas or in large parks in urban areas were more severely affected than those of comparable size in typical town areas, and large trees more than small ones. Older and larger trees bore abundant sporulating cankers, especially on the lower branches, where inadequate aeration and greater humidity favour fungal development. In urban districts such branches are probably removed yearly, with a reduction in the amount of inoculum.

Fritz (Clara W.). **Fructification of Poria cocos (Schw.) Wolf on Poplar.**—*Canad. J. Bot.*, 32, 4, pp. 545–548, 1 pl., 1954.

Sporophores of *Poria cocos* [*R.A.M.*, 34, p. 115] developed in storage in 1953–4 on two poplar pulpwood bolts cut in 1951 and 1952 on Manitoulin Island, Ontario. Cultures of the fungus were obtained from 27 similar bolts.

Graham (S. A.) & Harrison (R. P.). **Insect attacks and Hypoxylon infections in Aspen.**—*J. For.*, 52, 10, pp. 741–743, 1954.

Field observations in 1952 and 1953, conducted by the School of Natural Resources, University of Michigan, Ann Arbor, on canker (*Hypoxylon pruinatum*) of aspens (*Populus tremuloides* and *P. grandidentata*) [*R.A.M.*, 32, p. 222] have shown that of the 138 cankers identified in the Lower Peninsula of Michigan, 95 per cent. originated in injuries caused by various insects. It is suggested that such infections could be reduced by controlling the insects directly or indirectly responsible for them.

Banerjee (S.) & Mukherjee (N.). **Production of fructifications of Marasmius campanella Holterm. in culture.**—*Curr. Sci.*, 23, 9, pp. 298–299, 1 fig., 1954.

In studies at the Department of Botany, University of Calcutta, India, on the decay of standing trees of *Lagerstroemia speciosa* caused by *Marasmius campanella* successful fructification of the fungus was obtained by culturing on potato dextrose

or malt agars in open Petri dishes under bell-jars lined with moist blotting-paper in diffuse light at room temperature (28° to 29° C.). Badcock's 'accelerator' medium [*R.A.M.*, 23, p. 157] was not necessary. Fructifications were eventually obtained in test-tubes, when the mycelium completely filled the sawdust plus 'accelerator' medium, by making a hole in the bottom of the tube, replacing the plug with a sterile absorbent cotton plug pushed into contact with the medium, and inverting the tube into a beaker of distilled water under a damp bell-jar as before. The sporophores, mostly centrally stipitate, varied considerably in size, the pileus being 12 to 20 mm. across and the stipe 10 to 20 mm. long. They discharged spores copiously for several days.

Plakidas (A. G.). **Spot anthracnose of Chinese Holly.**—*Mycologia*, 46, 3, pp. 346–353, 2 figs., 1954.

In January, 1947, several Chinese holly trees (*Ilex cornuta*) at Hammond, Louisiana, developed a spot anthracnose on the leaves, shoots, and berries caused by *Elsinoe ilicis* n.sp. The infected trees had been grown from seed from a tree at Louisiana State University, Baton Rouge, but although this tree was subsequently found to be affected, seed transmission is considered highly improbable. No other infected hosts were found at Hammond.

Two types of symptoms occur on the leaves. Type A is present in late autumn and is the more prevalent. It consists of numerous small, black spots, confined to the upper surface, which gradually enlarge to 1 to 2 mm. in diameter. They frequently coalesce into irregular black patches sometimes covering half the leaf surface, generally the apical half. Occasionally they may be scattered evenly over the entire leaf surface. Injury is restricted to the upper epidermis and palisade cells.

Type B, also confined to the upper surface, develops in early summer and consists of a large lesion (or occasionally more than one), often about $1\frac{1}{2}$ in. long, typically confined to one half of the leaf blade, which becomes distorted. Injury reaches the lower surface. In the early stages the affected areas are somewhat chlorotic with irregular brown patches, in which there are masses of subcuticular mycelium. Later, the epidermis ruptures and sloughs off, the lesion turning dark grey. When most of the epidermis has disappeared, the surface of the lesion becomes rough, hard, and carbonaceous. Bark lesions on the shoots were $\frac{1}{2}$ to 4 mm. in diameter, flat or slightly raised, brown at first, later with greyish centres. Those on the berries were similar, becoming corky and cracked.

Acervuli arose from the intra-epidermal mycelium as raised, compact, stromatic structures breaking through the cuticle; they measured 42 to 112 by 21 to 42 μ. The conidia, observed in culture only, were hyaline, unicellular, ovoid to ellipsoid, and measured 3·6 to 7 by 1·5 to 2·4 (average 4·85 to 1·71) μ. The pyriform asci measured 24 by 14 μ, and the oblong, hyaline, septate ascospores were 8·5 to 12·5 by 3 to 4 μ.

A limited number of inoculations with pure cultures of the fungus on small potted plants grown from cuttings taken from one tree gave positive results in every case, though not all the symptoms seen in nature were reproduced.

Biraghi (A.). **Some important diseases of conifers in Italy.**—*F.A.O. Pl. Prot. Bull.*, 2, 11, pp. 166–167, 1954.

In 1952 *Phaeocryptopus gaeumanni* [cf. *R.A.M.*, 33, p. 325], not previously found in Italy [C.M.I. map No. 42], caused the death or defoliation of Douglas firs (*Pseudotsuga taxifolia*) about 30 years old growing in an experimental plot near Tolmezzo, province of Udine. The disease subsequently spread and all the remaining trees appear likely to succumb.

Melampsora pinitorqua [*R.A.M.*, 33, p. 647] has become moderately prevalent along the Tuscany coast. In 1954 it was also found in the interior of the province of Arezzo and on the Riviera, near San Remo. It attacks *Pinus pinea*, *P. pinaster*, and *P. sylvestris* and is prevalent on seedlings and one- to two-year-old trees [cf. 34, p. 117]. In the state forest at Feniglia, province of Grosseto, the rust destroyed nearly all the nurseries of *P. pinea* in 1951.

Needle rust of spruce (*Picea abies*) caused by *Chrysomyxa rhododendri* [cf. 22, p. 231; 32, p. 421] was very severe recently. The alternate hosts in Italy are *Rhododendron ferrugineum* and *R. hirsutum*; if these species are present only in small, sparse groups in any forest, their eradication offers a promising possibility of controlling the disease.

Salisbury (P. J.). **Some aspects of conifer seed microflora.**—*Bi-m. Progr. Rep. Dep. Agric. Can.*, 9, 6, pp. 3–4, 1953.

Assays of 23 conifer seed samples, mostly from British Columbia, demonstrated that many commercial lots have up to 10,000,000 viable moulds per gm., though there appeared to be no close correlation between high mould content and low viability. The immediate injury to the seed of some species does not appear to be great, probably because of the protection afforded by the heavy seed coats. Apparently undamaged seed contained mycelium in the outer layer of cells of the coat. Cultures from surface-sterilized seed showed that moulds may penetrate Douglas fir [*Pseudotsuga taxifolia*] seed, and may be present externally and internally.

The fungi most commonly found were *Penicillium* spp., *Mucor* spp., *Aspergillus glaucus*, and *Pullularia* sp. Five out of six isolates of *A. glaucus* failed to grow at 5° C., but nearly all the 18 isolates tested from the other three genera grew, showing that some of the more prevalent seed moulds can grow at temperatures similar to those at which conifer seed is usually stored in British Columbia. Mould growth would not be expected, however, in seed stored at a moisture content of 8 per cent. or less.

Henriksen (H. A.) & Jørgensen (E.). **Rodfordaerverangreb i relation til udhugningsgrad.** [Root-destroyer attack in relation to grade of thinning.]—*Forstl. Forsøgsv. Danm.*, 21, 2, pp. 215–251, 7 figs., 1 graph, 1954. [English summary.]

Further studies on the factors affecting the development of *Fomes annosus* on conifers in Denmark [*R.A.M.*, 31, p. 412] were concerned with the influence of thinning practices on the infection of spruce in three sample plots. On one, dating from 1893, planted on deep-ploughed heath in a mixture with pine, in which thinning operations were started in 1932, the root rot was definitely more severe where drastic methods were practised [see next abstract], but in the other two plots the differences between these and more conservative procedures were not so clear. The possible reasons for the tendency to more virulent infection in heavily thinned plots are fully discussed but no definite conclusions are reached.

Oksbjerg (E.) & West-Nielsen (G.). **Om rodfordaerverangreb.** [On root-destroyer attack.]—*Hedeselsk. Tidsskr., Aarhus*, 74, 15, pp. 319–334, 3 diags., 1953. [Received January, 1955.]

The increasing frequency of *Trametes* [*Fomes annosus*] infection of spruce in Denmark [*R.A.M.*, 29, p. 391 and preceding abstract] since the dry summer of 1947 is discussed in relation to silvicultural practices on heathland, where about half the 40- to 70-year-old stands are involved. From the replies to a questionnaire circulated to foresters in two districts of Jutland, the severity of the rot appears to

increase with intensity of cultivation, culminating on double-ploughed and arable soils. The only definite conclusion emerging from a series of fertilizing experiments initiated in 1921–2 is that removal of the brushwood cover and application of lime and manure to the soil tend to enhance susceptibility.

GEORGESCU (C.) & GAȘMET (V.). **Un atac de Rosellinia byssiseda (Tode) Schroet., la puieții de Molid.** [An attack of *Rosellinia byssiseda* (Tode) Schroet. on Spruce seedlings.]—*Rev. Padurilor*, 68, 4, pp. 31–34, 8 figs., 1954. [Russian summary.]

A disease caused by *Rosellinia byssiseda*, which developed on three-year-old spruce seedlings in a forest nursery in Rumania, probably resulted from not pricking out the seedlings. The fungus leads a saprophytic life on dry branches and needles, which form into one brown mass bearing perithecia, and then spreads to the living branches and needles, which dry up as a result. The importance of thinning two-year-old seedlings is emphasized.

ETHERIDGE (D. E.). **Decay of subalpine Spruce on the Rocky Mountains Forest Reserves in Alberta.**—*Bi-m. Progr. Rep. Dep. Agric. Can.*, 9, 6, p. 3, 1953.

During 1950 and 1952 an investigation of decay in 456 living spruce trees (*Picea glauca*, *P. engelmanni*, and *P. mariana*) was carried out on 12 sample plots totalling 1·8 acres in the Rocky Mountains Forest Reserves by members of the Saskatoon and Calgary Forest Biology (Pathology) Laboratories. About 35 per cent. of the trees were decayed, cull amounting to almost 20 per cent. of the gross merchantable volume of the sample. Only 1 per cent. of the 100-year-old trees had decay, but above this age there was an increasing number of infected trees up to 160 years when half the trees could be expected to be decayed. All the trees over 300 years old that were examined were diseased.

Thirteen of the 14 species of fungi most commonly isolated were wood-destroying basidiomycetes. Of three unidentified fungi belonging to this group two have been assigned to M. K. Nobles' temporary designations 'unknown C' and 'unknown M'. The one non-basidiomycetous fungus most frequently isolated is thought to be the imperfect form of *Coryne sarcoides* [*R.A.M.*, 21, p. 396]; it is not known whether this fungus is capable of destroying wood.

The order of importance as wood-destroyers in this area of the fungi most frequently isolated from root- and butt-rots is: *Polyporus circinatus* var. *dualis* [32, p. 520], *Flammula connissans* [32, p. 664], 'unknown C', and *Coniophora puteana* [32, p. 520]. *Fomes pini* [loc. cit.], which was responsible for 25 per cent. of the total cull, *Stereum sanguinolentum* [32, p. 521], and 'unknown M' are the most important causes of trunk rots.

PAINE (L. A.). **Deterioration in White Spruce plantations.**—*Bi-m. Progr. Rep. Dep. Agric. Can.*, 9, 6, p. 1, 1953.

Young plantations of white spruce (*Picea glauca*) in the vicinity of Grand'Mère, Quebec, are seriously deteriorating. Stand damage ranges from the presence of openings of about $\frac{1}{10}$ acre to a point where healthy trees are isolated exceptions. The symptoms are chlorosis, stunting, and poor needle retention; many trees have dead tops or are completely dead. Preliminary investigation suggests that the injury may be associated with soil moisture conditions or toxic accumulations. Lack of available nutrients is unquestionably an important factor. All the trees are situated on abandoned farm land. Mycorrhizal development is generally sparse, but is best where the trees are in good condition and where, it may be assumed, the ground had been manured.

Engelhardt (N. T.). **Deterioration of looper-killed Western Hemlock on Lower Vancouver Island.**—*Bi-m. Progr. Rep. Dep. Agric. Can.*, 9, 6, p. 4, 1953.

During 1945 and 1946 extensive stands of mature western hemlock [*Tsuga heterophylla*] on lower Vancouver Island developed severe infestation by insects and many defoliated trees died and rotted. Losses, estimated in 1953 to average between 5 and 10 per cent. of the average gross volume, were attributed to the combined action of weathering and weakening by fungi and insects. Brown crumbly rot (*Fomes pinicola*) [*R.A.M.*, 31, p. 215] accounted for 87 per cent. of the decay volume. Yellow stringy and white spongy rots, associated mainly with fungi tentatively identified as *Armillaria mellea* [loc. cit.] and *F. annosus* [loc. cit.], were responsible for most of the remaining decay, primarily confined to the lower sections of the butt. Pitted sap rot (*Polyporus* [*Polystictus*] *abietinus*) [33, p. 647] was present in the sapwood of some trees, but not in measurable quantities, though in earlier examinations it had been one of the more important causes of sap rot.

Saraví Cisneros (R.). **Cancrosis de los Cipreses provocada por 'Coryneum cardinale' Wagener en la provincia de Buenos Aires (Argentina).** [Cancrosis of Cypresses caused by *Coryneum cardinale* Wagener in the province of Buenos Aires (Argentina).]—*Rev. Fac. Agron. Eva Perón* (formerly *Rev. Fac. Agron. B. Aires*), Ser. 3, 29, 1, pp. 107–119, 2 figs., 1953. [English summary. Received 1954.]

Coryneum cardinale is reported for the first time in Argentina in Necochea, province of Buenos Aires, where it causes serious damage to *Cupressus macrocarpa* var. *lambertiana* [cf. *R.A.M.*, 30, p. 352]. The study, based partly on the literature, deals with the history, symptoms, and control of the disease, and the cultural characters, host range, and pathogenicity of the causal organism. In inoculation experiments the leaves wilted as the result of their being wounded and sprayed with a spore suspension of *Coryneum cardinale*. This is considered to be a new symptom of the disease.

Zhuravlev (I. I.). Вирулентность Фузариумов вызывающих полегание всходов Сосны. [The virulence of *Fusaria* responsible for the death of Pine seedlings.]—Микробиология [*Microbiology, Moscow*], 21, 5, pp. 588–593, 1952.

The virulence of 11 species of *Fusarium* known to cause ultimate death of pine seedlings in the U.S.S.R. [cf. *R.A.M.*, 28, p. 259] were studied at the Leningrad Regional Control Station of Forest Seeds. Some of them, *F. poae*, *F. moniliforme* [*Gibberella fujikuroi*: cf. 7, p. 607], *F. anguioides*, and *F. caeruleum* in particular, killed 75 to 95 per cent. of the seeds, seedlings, and shoots. Losses, which are independent of the source of infection, are almost equal for seeds, shoots, and seedlings when the seeds or the soil have the same amount of initial infection (estimated by the number of conidia and their contact with the seeds). In general, losses are greater when germinating seeds are planted than when dormant seeds are sown without previous preparation. Early diagnosis is essential and weakly or poor seedlings must be treated immediately.

Roth (E. R.). **Spread and intensification of the little leaf disease of Pine.**—*J. For.*, 52, 8, pp. 592–596, 30 graphs, 7 maps, 1954.

The course of the little leaf disease of shortleaf pine (*Pinus echinata*) [*R.A.M.*, 32, p. 42; 34, p. 5], associated with soil type and the presence of *Phytophthora cinnamomi*, was studied in the south-east of the United States from 1940 to 1951. To determine the intensification of the disease, 31 plots (covering 4 to 10 acres each) with various degrees of infection were grouped according to their highest degree of little leaf over a 10 year period. Disease spread was studied in five large areas

(over 800 acres each) near the edge of the diseased area. The results indicate a tendency for trees in some areas to become more severely affected than in others. Intensification varies from one season to the next. Recovery is rare. Little leaf increased from an average of 4 per cent. in 1942 to 18 per cent. in 1951. The disease, except in isolated instances, is not extending outside the little leaf belt, as understood in 1942. In some places within the belt, however, it is becoming more serious while in others it remains more or less constant; some large areas are still entirely disease-free.

Henry (B. W.). **Sporulation by the brown spot fungus on Longleaf Pine needles.**—*Phytopathology*, 44, 7, pp. 385–386, 1954.

To determine the frequency of occurrence of *Scirrhia acicola* ascospores on longleaf pine (*Pinus palustris*) needles [*R.A.M.*, 32, p. 224; 34, p. 118], at least six brown spot-diseased needles were collected at bi-weekly intervals from January, 1952, to February, 1953, inclusive, from each of five seedlings planted in February, 1949, in the Harrison Experimental Forest, Saucier, Mississippi. Conidia were detected on the localized brown spots on living needles and on dead material throughout the period, while ascospores were found in every month except the first on dead and partially necrotic needles. From these observations it appears that ascospores, previously reported to occur only during the winter and spring [23, p. 505], may be concerned [to an undetermined extent] in the epidemiology of brown spot.

Hvass (J.). **Douglasgran og sodskimmel.** [Douglas Fir and the soot fungus.]—*Dansk Skovforen. Tidsskr.*, 37, pp. 97–107, 3 figs., 1952. [Received January, 1955.]

The occurrence of *Phaeocryptopus gaeumanni* on Douglas fir [*Pseudotsuga taxifolia*] in Denmark [*R.A.M.*, 32, p. 410] is discussed in relation to silvicultural practices, with special emphasis on the use of home-grown seed [cf. 34, p. 6] and provision for the access of air and light to the plantings.

Thomas (G. P.) & Thomas (R. W.). **Studies in forest pathology. XIV. Decay of Douglas Fir in the coastal region of British Columbia.**—*Canad. J. Bot.*, 32, 5, pp. 630–653, 2 pl., 1 map, 1954.

Further work in this series [cf. *R.A.M.*, 34, p. 3], comprising an investigation of Douglas fir (*Pseudotsuga taxifolia*) in coastal British Columbia [33, p. 693], revealed that decay losses in old-growth stands are low, amounting to only 2·6 per cent. of the gross volume of living trees and 7·3 per cent. of living and dead combined. Living trees yielded 25 decay-producing fungi and the dead 29, the most important being *Fomes pini* (chiefly on living trees), *Polyporus schweinitzii*, and *F. pinicola* [32, p. 521]. Irregularities in the occurrence of decay-producing fungi and the amounts of decay associated with them were related to site, tree age or size, latitude, or stand history, Although root infections were the most frequent, branch-stub infections caused the greatest average amount of decay. Various abnormalities, notably sporophores and swollen knots of *F. pini*, were useful indicators of hidden decay. A separate analysis of dead trees revealed that they occasionally form a high proportion of Douglas fir stands and that much of their timber is sound.

Wilson (Irene M.). **Ceriosporopsis halima Linder and Ceriosporopsis cambrensis sp. nov. : two marine Pyrenomycetes on wood.**—*Trans. Brit. mycol. Soc.*, 37, 3, pp. 272–285, 23 figs., 1954.

Collections of *Ceriosporopsis halima* [*R.A.M.*, 31, p. 301] along the Welsh coast at Watwick Bay, Pembrokeshire, and Aberystwyth, Cardiganshire, have enabled

some details to be added to the original description [23, p. 360], notably the presence of a long perithecial neck. Two collections were also made of another species differing from *C. halima* mainly in its larger perithecia and spores and its paler colour; it is described as *C. cambrensis* n.sp. Their importance, if any, lies in their ability to facilitate the entry of boring crustaceans into timber in the intertidal region near low-water mark.

Schuch (K.). **Chemische Untersuchungen an alten 'Kupfervitriolstangen'.** [Chemical studies on old 'copper sulphate poles'.]—*Holz a. Roh- u. Werkst.*, **12**, 3, pp. 91–95, 1 diag., 1954.

The results of chemical tests at the Institute for Applied Mycology and Wood Preservation, Hann.-Münden, Germany, on two sections each of three pinewood telegraph poles treated by the Boucherie process [*R.A.M.*, **32**, p. 1 *et passim*] and removed in 1951 after standing since 1880, 1900, and 1902, respectively, are fully described and tabulated. Samples from the two poles of the later dates were investigated for their copper sulphate content which amounted to 3 and 3·8 kg. per cu. m. in the underground and to 4 and 4·6 kg. in the aerial portions. Thus, after 50 years' service, the copper residue would still confer adequate protection against lignicolous fungi attacking the poles above soil-level, but it would not be sufficient to repel the soil-inhabiting species.

Koch (J. E.). **Die Erfindung der holzschützenden U-Salze.** [The discovery of the wood-protecting U-salts.]—*Chem. Ztg*, 78, 10, pp. 325–328, 1954. [English, French, and Italian summaries.]

An account is given of the trends of thought and experiments leading up to the development in Germany of the group of timber preservatives collectively known as U-salts and represented by triolith-U, basilite-U, and tanalith-U or basilite-UA [cf. *R.A.M.*, 33, p. 514]. They are distinguished by a very high order of resistance to leaching.

Koljo (B.). **Einfluss der Tränkverfahren auf die Tränkstoffaufnahme in der Holzimprägnierung.** [Influence of the absorption process on preservative absorption in timber impregnation.]—*Holz a. Roh- u. Werkst.*, **12**, 1, pp. 7–16, 1 fig., 1 diag., 4 graphs, 1954.

From the results of studies, herein fully described, at the Swedish Timber Research Institute, Stockholm, it is concluded that for the full saturation of timber with water or weak salt solutions, the vacuum or vacuum-pressure methods should be applied to species difficult to impregnate, such as pine and oak heartwood and spruce, whereas the vacuum and open-tank processes are preferable for birch and pine sapwood, which readily take up preservatives [*R.A.M.*, 33, p. 458]. Any of these methods may be used for the treatment of the latter class of woods with tar oil, but none can be recommended for the former. In the economical Rueping process [31, p. 309], a pre- to post-pressure ratio of 3:6 kg. per sq. m. permitted the absorption of satisfactory quantities of tar oil by pine sapwood, but the levels were too high for birch and barely sufficient for the other woods.

Skene (J. K. M.). **Manganese deficiency in vegetable crops. Part I—Facts for the vegetable grower.**—*J. Dep. Agric. Vict.*, 52, 11, pp. 505–509, 6 figs., 1954.

Manganese deficiency occurs in cabbages, Brussels sprouts, cauliflowers, red beets, peas, French beans [*Phaseolus vulgaris*], parsnips, marrows, cucumbers, and tomatoes in the Melbourne metropolitan area [cf. *R.A.M.*, 23, pp. 148, 244], chiefly on the deep-surface, grey sands found in the 'sand belt' between Clayton, Dandenong, and Cheltenham and also on a deep-surface, dark grey, sandy clay

loam at North Narre Warren. The condition is associated with over-liming to more than pH 6·3. The symptoms on the above hosts and methods of control by careful liming, soil applications of sulphur and sulphate of ammonia, and both soil and spray applications of manganese sulphate are described. A warning of the dangers of manganese toxicity [34, p. 72] is appended.

Bain (D. C.). **Blackrot resistance in Cabbage.**—Abs. in *Phytopathology*, 44, 6, p. 331, 1954.

In further tests [at the Truck Crops Branch Station, Crystal Springs, Mississippi] on varietal resistance to black rot [*Xanthomonas campestris*] in cabbage [*R.A.M.*, 31, p. 96], less than 5 per cent. of the seedlings from selfed Huguenot resistant selections contracted the disease after seed inoculation, and this resistance was carried to the F_2, field-tested in 1952 and 1953 after two stem injections and three sprays of inoculum. Similar results were obtained with F_1 inbred selections from Early Fuji. Plants from crosses between the Huguenot inbred line and diseased and healthy plants of commercial varieties developed no black rot symptoms within three weeks of two injections into the stems, whereas all the [susceptible] controls succumbed inside 10 days. These results are interpreted as evidence for the existence in cabbage of one or more factors for resistance to *X. campestris*.

Sutton (M. D.) & Bell (W.). **The use of aureomycin as a treatment of Swede seed for the control of black rot (Xanthomonas campestris).**—*Plant Dis. Reptr*, 38, 8, pp. 547–552, 2 figs., 1954. [Multilithed.]

At the Division of Botany and Plant Pathology, Ottawa, Canada, the effectiveness of aureomycin was compared with ten other seed treatments recommended for the control of black rot (*Xanthomonas campestris*) [*R.A.M.*, 24, p. 492] on swede. Laurentian seed was artificially infected by soaking for six hours in a heavy nutrient broth suspension of a virulent culture of the bacterium and dried at room temperature. After most of the treatments the seed was stored in open flasks for five to seven days. Preliminary evaluation was made by measuring the inhibition zones round uninfected, treated seeds plated on agar seeded with *X. campestris* or by determining the percentage of infected, treated seeds developing bacterial colonies on non-seeded agar. Phytotoxicity and seedling infection were determined in greenhouse and field tests, and root rot at maturity in the field.

A 30-minute immersion in 1:1,000 aureomycin followed by drying for at least three days effectively controlled the disease and was non-phytotoxic. It was more efficient than the other treatments, including hot-water. Aureomycin was compatible with both arasan and spergon and lost no effectiveness even after nine months' storage of treated seed. Dusting the seed with arasan and spergon following aureomycin treatment is recommended, as the latter is believed to be of little value as a protectant against soil-borne pathogenic fungi.

Ramsey (G. B.), Smith (M. A.), & Wright (W. R.). **Peronospora in Radish roots.**—*Phytopathology*, 44, 7, pp. 384–385, 1 fig., 1954.

Peronospora parasitica is uncommon on radishes [cf. *R.A.M.*, 29, p. 71] or has not been recognized, but root discoloration by the fungus caused heavy losses on the Red Globe variety grown in the market-garden district south of Chicago during October, 1953. Similar damage to topped radishes pre-packaged in polyethylene bags was also observed at shipping points in Texas and Florida during February and March, 1954. The pathogen is occasionally found on marketed cauliflower curds, cabbage heads, and turnips [15, p. 188].

The brown to black, epidermal discolorations were generally situated about half-way down the sides of the radish roots, sometimes in the form of an elongated

streak but more often spreading as a blotch round the circumference and accompanied by slight russeting and some cracking. The internal flesh was firm and greyish-brown to black. The prevalence of infection $\frac{1}{4}$ to $\frac{1}{2}$ in. below the crown suggested contamination by spores washed down from the leaves during the latter part of the growing season, and this was confirmed by experimental inoculations with an aqueous conidial suspension on the sides of ten healthy, uninjured roots maintained at a temperature of 60° to 72° F. in a moist chamber. Within a week infection developed in eight, while six healthy controls remained free from disease. In tests on freshly cut root surfaces the fungus penetrated to a depth of $\frac{1}{4}$ in. in five days. Sections of naturally and artificially discoloured epidermal and internal tissues revealed the extensive hyphal invasion and haustorial development characteristic of *Peronospora*.

Fuchs (W. H.) & Reiss (U.). **Übertragung der Rübengelbsucht-Virus (Corium betae) mit Hilfe von Cuscuta.** [Transmission of the Beet yellows virus (*Corium betae*) with the aid of *Cuscuta*.] —*Naturwissenschaften*, 41, 21, p. 506, 1954.

At the Institute for Plant Pathology and Plant Protection, Göttingen, Germany, all the eight healthy beet plants maintained in contact for six weeks with a yellows virus-diseased beet by means of *Cuscuta gronovii* were found to have contracted infection on the severance of the connecting haustorial 'bridges'.

Hansen (H. P.). **Et overblik over nyere erfaringer om virus-gulsot hos Bederoer.** [A survey of recent observations on virus yellows of Beetroots.]—*Tidsskr. Planteavl*, 58, 2, pp. 298–332, 1954.

This useful survey of recent contributions (mostly covering the period from 1950 to 1952 but including some earlier and a few of 1953) to the literature on beet virus yellows comprises sections on the geographical distribution of the disease; its economic importance in Denmark [*R.A.M.*, 30, p. 399] and other countries; symptomatology; modes of infection; the virus *in vitro* and *in vivo*; various types of the yellows virus; host plants and reservoirs of infection; ecology of the aphid vectors; appearance and spread of the disease; immunity and resistance within the genus *Beta*; influence of cultural practices on the severity of infection; isolation from reservoirs of infection; and control of the virus.

Skolko (A. J.), Groves (J. W.), & Wallen (V. R.). **Ascochyta diseases of Peas in Canada—with special reference to seed transmission.**—*Canad. J. agric. Sci.*, 34, 4, pp. 417–428, 1954.

This is a full acount of work noticed from an abstract from another source [*R.A.M.*, 33, p. 332]. In varietal field tests over five years in Ottawa inoculum consisting of pea seed infected with a mixture of ten isolates of *Ascochyta pisi* was applied to the soil at the base of pea plants just after emergence. Seedling mortality, unless severe, had little effect on yield; the amount of spotting on leaf, stem, and pod was not closely correlated with later seed infection, which appeared to depend on weather conditions at the time of maturity, early pod infection under conditions favourable for disease resulting in the failure of the seed to mature. Heavily diseased plants often produced relatively disease-free seed, while apparently healthy plants sometimes produced heavily infected seed. The varieties with least seed infection (less than 5 per cent.) over the five-year period were Alaska and A-100; Thos. Laxton, usually classed as susceptible, came next (5·8 per cent.); Advancer, Super Alaska, Climax Foreign 3, Chancellor, Superior W.R., Perfection, and Arthur all had less than 10 per cent. Field varieties were less susceptible than garden peas.

McWhorter (F. P.). **The virus disease complex in canning Peas.**—*Plant Dis. Reptr*, 38, 7, pp. 453–457, 1954. [Multilithed.]

Surveys made in 1952 and 1953 of the canning pea areas of Oregon revealed that in all fields with an appreciable amount of virus infection most plants contained more than one virus. Pea enation mosaic virus [*R.A.M.*, 34, pp. 70, 122] was combined with western ringspot [34, p. 123], lucerne mosaic, or both, or with an undetermined virus, SG. Bean yellow mosaic occurred rarely, usually with western ring spot. Field and greenhouse studies showed that [unspecified] aphids can transmit mixtures of certain viruses that are not transmissible separately; thus, western ring spot, for which no vector was known, was carried with enation mosaic. Mingling of viruses may extend their host range, thereby complicating control. For example, enation mosaic virus was transferred from peas, where it was combined with western ringspot, to beans [*Phaseolus vulgaris*], producing an apparently new disease. It is suggested that enation mosaic virus may occur unrecognized in other leguminous plants, particularly lucerne. The need for early insecticide applications to prevent the building up of aphid populations on young pea plants is emphasized.

Wark (D. C.). **Factors influencing the development of bacterial blight of Peas.**—*Aust. J. agric. Res.*, 5, 3, pp. 365–371, 1954.

When pea seed naturally contaminated with bacterial blight (*Pseudomonas pisi*) was harvested from a single row and sown at Canberra at different times of the year, the disease in the seedlings appeared to be more severe on certain soil types than on others, especially after frost. A study was therefore made of the effect of environmental factors on the build-up of bacterial numbers within the plant and the subsequent development of symptoms.

William Massey seed, known to be contaminated with *P. pisi*, was sown in pots and after emergence six pots were placed outdoors overnight (minimum temperature −5·5° C.), six in frames (−1·7°), and six in a heated greenhouse (4·4°). Two days later the numbers of bacterial colonies arising per leaf disk 0·5 cm. in diameter, determined by plate counts, were 43,000, 10,033, and 6, respectively; 14 days after frosting 10·8, 3·3, and 0·4 per cent., respectively, of the tops had developed bacterial lesions.

When plants grown from naturally contaminated seed were exposed to artificial frosting for six minutes William Massey produced one colony per disk following treatment at 0°, 5,425 at −2°, 60,550 at −4°, and 53,425 at −6°, the percentages of tissue developing symptoms later being 0, 2·3, 24·6, and 24·1, respectively; the corresponding figures for Greenfeast were 819, 6,168, 45,900, and 48,675 colonies and 1·7, 3·1, 13·7, and 15·1 per cent. tissue.

When germinating William Massey seeds dipped in a suspension of *P. pisi* were grown in pots of red-brown loam from the Dickson Experiment Station the plants developed 12·1 per cent. (by weight) leaf and stem infection, compared with 7·2 in sterilized potting soil. Other experimental evidence demonstrated that after exposure to high atmospheric humidity plants grown in Dickson soil or prepared potting soil developed symptoms more rapidly at a high soil-moisture content (80 per cent. of water-holding capacity) than at lower ones (40 or 60 per cent.).

In view of G. W. Scarth's findings (*New Phytol.*, 43, pp. 1–12, 1944) that frost decreases cell volume probably by loss of moisture to the intercellular spaces, it is thought that such an increase in humidity in the spaces would establish a microenvironment favourable to the multiplication of the bacteria. Cell rupture, which also occurs in conditions of severe frost, would release cell nutrients and still further stimulate the bacteria. In the field spread would be further favoured by the facilitated entry of the pathogen into frost-injured surface tissue. In the absence of frost

high soil moisture probably causes an increase in the humidity of the intercellular spaces, so favouring the growth of the bacteria.

Blomfield (P. D.). **Note on molybdenum response on Peas in Nelson.**—*N.Z.J.Sci.*, Sect. A, 36, 1, p. 46, 1954.

Experiments were carried out on a variety of soil types to determine the effect of molybdenum on Greenfeast peas [cf. *R.A.M.*, 33, p. 7] at Nelson, New Zealand, in 1953. The most definite response was obtained on a Motupiko silt loam in two trials with molybdenum at 2 oz. per acre, one as a pre-emergence spray, the other when the plants were 2 in. high. The treated peas were more resistant to collar [foot] rot [*Ascochyta pisi*, *A. pinodella*, and *Mycosphaerella pinodes*: 32, p. 415], the lesions being smaller than on the untreated, and the yield was doubled.

[This information also appears in *N.Z. J. Agric.*, 89, 3, p. 280, 1 fig., 1954.]

Harrison (D. E.). **White rot of Onions in Victoria.**—*J. Dep. Agric. Vict.*, 52, 11, pp. 510–520, 525, 7 figs., 1 map, 1954.

The onion acreage in the Warrnambool area of Victoria has been reduced by about half during the past 10 to 15 years largely owing to depredations by white rot (*Sclerotium cepivorum*) [*R.A.M.*, 22, p. 422]. A survey in 1952–3 revealed that of approximately 800 acres on 300 or more farms about half the farms were affected, the degree of infection varying from a trace to 50 per cent. The disease did not occur, however, on the limestone soils of the Rosebrook area. The position is worse in the Colac area, where at least 10 per cent. of the current season crop is infected and many hundreds of acres of the richest soil have been permanently put down to pasture. The disease is also present in the Melbourne metropolitan market garden area but is largely controlled by crop rotation combined with heavy liming and the destruction of onion refuse.

Stubbs (unpublished thesis submitted to the University of Melbourne, 1948) states that the fungus enters the bulb only through the roots and confirms that the number of diseased plants in any field is dependent on the amount of inoculum in the soil. The roots are infected mostly by coming into contact with diseased onion refuse, particularly bulb scales.

The disease is disseminated from infected bulbs and seedlings, in soil adhering to farm implements and machinery, by wind, and in running water, used onion bags, and the excreta of farm animals fed on diseased onions. Spread to non-infested areas should be prevented by avoiding the above means of dissemination, not introducing shallots, garlic, or onion bulbs from an infected area, and destroying diseased refuse. Stubbs found in laboratory tests that 1:10,000 mercuric chloride markedly inhibited the growth of *S. cepivorum* and this was confirmed in a small-scale field trial in which 4 per cent. calomel dust [cf. 33, p. 134] and approximately 1:5,000 mercuric chloride both gave good control of white rot; but in heavily infested areas no fungicidal method was markedly successful in five seasons. Treatment of the seedling roots with a paste made of 1 lb. 4 per cent. calomel dust and $\frac{1}{3}$ pint water is suggested. There appears to be no indication of resistance in onion varieties.

Thomas (W. D.) & Weinhold (A. R.). **Xanthomonas striaformans, a new bacterial pathogen of Onion.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 5, p. 23, 1953.

Since 1948 Sweet Spanish onions in the Arkansas Valley of Colorado have been affected by a mottled brown streaking of the older leaves and leaf sheaths which develops at temperatures exceeding 75° F. The causal organism, *Xanthomonas striaformans* n.sp., is a Gram-negative rod, 1 by 0·5 μ, with one or two polar flagella, slowly liquefying gelatin and reducing methylene blue and nitrates; acid

is evolved from arabinose, glucose, fructose, mannose, sucrose, dextrin, sorbitol, and mannitol. The optimum temperatures are 28° to 30° C. and the pH 7 to 8.

Rusakova (Mme A. A.) & Raskin (S. E.). Препарат ТМТД для протравливания семенных корнеплодов Моркови. [Preparation TMTD for the disinfection of seed Carrots.]—Земледелие [*Zemledelie, Moscow*], 2, 8, pp. 39–43, 4 figs., 1954.

Experiments carried out in the U.S.S.R. in 1952–3 for the control of carrot black rot [*Stemphylium radicinum*], phomosis [*Phoma rostrupii*: *R.A.M.*, 32, p. 296 and next abstract], and white rot [*Sclerotinia sclerotiorum*: cf. 30, p. 301] indicate that dry treatment of the roots with 50 per cent. thiram is justified economically and gives the best results when applied once in the autumn (6 to 7 gm. per kg. roots) or twice (autumn and spring), when the rate should be reduced to 3 to 4 gm. The two applications are more effective, especially where losses after winter storage are serious. Pre-storage treatment or treatment during storage, consisting of dusting the store, the roots, and the sand covering them with 50 per cent. thiram, reduced the total amount of infection from 36·8 in 1951–2 and 22·3 and 77·3 per cent. in 1952–3 to 20·5, 12·5, and 23·4 per cent., respectively. In field trials in 1952 thiram treatment reduced seed carrot losses from 69 and 80 per cent. (untreated) on two farms to 29 and 39 per cent., respectively, after autumn treatment, to 32 and 52 per cent. following a spring treatment (careful pre-planting dusting of the roots), and to 31 and 38 per cent. after both autumn and spring treatments.

Cattle should not be grazed on material treated with a 2 per cent. suspension of thiram until 20 to 30 days after treatment.

Osnitskaya (Mme E. A.). Меры борьбы с фомозом Моркови. [Control measures against Carrot phomosis.]—Сад и Огород [*Orchard & Garden*], *1954*, 7, pp. 19–21, 1954.

In laboratory tests at the Scientific Research Institute for Vegetable Farming, U.S.S.R., from 1951 to 1954, inclusive, NIUIF–1 (1:300) was the most effective fungicide for the control of carrot phomosis [*Phoma rostrupii*: see preceding abstract], followed by granosan (8 gm. per kg. seed) and 50 per cent. thiram (10 gm.), resulting in 0·5, 1·5, and 2 per cent. infected shoots, respectively, as against 5·6 per cent. for the untreated. The corresponding figures for infected roots at harvest were 0·1, 0·3, 0·1, and 16·8 per cent., and in storage 0, 0, 0·9, and 2·8 per cent. In field trials in 1951–2 thiram was better than NIUIF–1 (1:400), reducing infection from 16·3 (untreated) to 2 per cent., compared with 4·7 for NIUIF–1. Thiram reduced seed carrot losses in 1953–4 from 92·4 (untreated) to 34·5 per cent. in the Moscow region.

Whitney (N. J.). **Investigations of Rhizoctonia crocorum (Pers.) DC. in relation to the violet root rot of Carrot.**—*Canad. J. Bot.*, 32, 5, pp. 679–704, 2 pl., 2 diags., 4 graphs, 1954.

Violet root rot (*Rhizoctonia crocorum*) [*Helicobasidium purpureum*: *R.A.M.*, 32, p. 666] appears on carrots in the Thetford Marsh, Ontario, in midsummer and by the autumn produces deep lesions in the fleshy root. The fungus was isolated only from mature infection bodies on diseased roots and grew best on meat-malt agar. Three types of hyphae were produced but only those of the subiculum propagated the fungus and only the subiculum and sclerotia were able to parasitize the carrot. Although development of the carrot plant, fungus growth, and infection all reached a maximum between pH 5·5 and 6·5, a much wider range was tolerated. The cardinal temperatures for infection were 5°, 20°, and 30° C. and the temperatures for optimum growth of the fungus and host and that for maximum

infection were closely correlated. Infection was initiated when the plants were eight weeks old and progressed until maturity. Initial penetration occurred through any part of the root, hyphal tips being forced between the cells of the periderm. Both inter- and intracellular hyphae were formed abundantly but none beyond the cambium. Infection bodies originated in periderm cells where intracellular hyphae accumulated in masses prior to producing external hyphae which formed a mycelial weft over the surface of the root. There were two types of histological response: either a cork layer was formed beneath the infection bodies, producing shallow lesions, or the infected tissues were broken down with the formation of deep lesions.

Deslandes (J. A.). **Studies and observations on Lettuce powdery mildew.**—*Plant Dis. Reptr*, 38, 8, pp. 560–562, 1954. [Multilithed.]

A three months' study at the Department of Plant Pathology, University of California, Davis, in 1952–3 on lettuce powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, 33, p. 282], carried out with potted greenhouse plants and detached leaves in Petri dishes, showed that a relative humidity of at least 85 per cent. was essential for conidial germination, infection, mycelial growth, and sporulation. Temperatures between 18° and 24° C. were favourable for germination and about 18° for growth. Good germination occurred in water or on water agar. The disease developed best on mature, strong, green leaves and poorly on young lettuce seedlings and rapidly growing plants. The lettuce strain produced perithecia on both detached leaves and potted plants of lettuce, *Lactuca scariola*, sunflower, chicory, bull thistle (*Silybum marianum*), and endive; other hosts are listed [cf. 16, p. 839; 34, p. 108]. *E. cichoracearum* from *L. scariola* in the Davis region was slightly pathogenic to Great Lakes lettuce [cf. 33, p. 282]. Favourable environment, susceptible hosts, and abundant inoculum are chiefly responsible for epiphytotics of the disease in the Salinas Valley.

Bakker (Martha). **Proeven ter bestrijding van rotting van Witlofwortels veroorzaakt door Sclerotinia sclerotiorum (Lib.) Massee.** [Experiments on the control of Chicory root rot caused by *Sclerotinia sclerotiorum* (Lib.) Massee.]—*Meded. Dir. Tuinb.*, 17, 5, pp. 356–361, 1954.

At the Phytopathological Research Institute, Wageningen, Holland, partial control of root rot (*Sclerotinia sclerotiorum*) of Brussels chicory [*R.A.M.*, 30, p. 56] was obtained by treatment with fusarex [31, p. 26], sprinkled on the roots in the forcing-bed at the rate of 150 gm. per sq. m., and aawitlo, an organic mercury compound, applied as a dip at a concentration of 0·25 per cent. The use of aawitlo, however, is precluded by the high mercury content of the treated plants, 0·265 and 1·2 p.p.m., respectively, in the leaves and roots, rendering them unfit for human or animal consumption. The results of laboratory studies indicate difficulty in the complete control of the disease by chemical methods, and the utmost importance is therefore attached to cultural practices, such as adequate crop rotation, root storage in a dry, cool place, and destruction of infective material in the forcing-beds.

Edwards (J. C.) & Shrivastava (K. N.). **Die-back of Chillie (Capsicum annuum L.) caused by Alternaria sp.**—*Curr. Sci.*, 23, 9, p. 301, 1954.

A species of *Alternaria* was found to be responsible for the die-back and subsequent death of chilli plants [cf. *R.A.M.*, 27, p. 458] six weeks after transplanting at the Biology Department farm, Agricultural Institute, Allahabad, India. The fungus was reisolated from inoculated plants in which typical symptoms of blackening developed.

Apple (J. L.) & Crossan (D. F.). **Pythium stem rot and wilt of Pepper.**—*Plant Dis. Reptr*, 38, 8, pp. 555–556, 1 fig., 1954. [Multilithed.]

A species of *Pythium*, generally agreeing with *P. aphanidermatum* [*R.A.M.*, 30, p. 446], was found to be responsible for stem rot and wilt of [chilli] pepper in eastern North Carolina. In one locality 30 per cent. of the plants were killed. The symptoms, similar to those produced by *Phytophthora capsici* [33, p. 72], were reproduced in inoculation experiments.

Reports Mushroom Research Station, Yaxley, for the years 1952 and 1953.—50 pp., 15 graphs, 1953; 46 pp., 1 fig., 10 graphs, 1954.

In the section of the 1952 report [cf. *R.A.M.*, 32, p. 299] dealing with casing soil, P. B. Flegg (pp. 8–19) observes that the growth of mushroom mycelium is slower in the absence of carbon dioxide [cf. 34, p. 75].

In discussing the results from general cropping experiments R. L. Edwards (pp. 30–37) reports that omission of potassium sulphate from synthetic compost had no significant effect on the yield, whereas omission of manganese sulphate gave a slight increase.

The use of ultra-violet radiation in the control of bacterial pit [see below; 32, p. 299] is described by Miss D. G. Gandy (pp. 38–46). The disease was checked by irradiation (2537 Å) from a 2 ft. low-pressure mercury discharge tube suspended 2 ft. above the trays, but some injury was caused to the mushrooms, especially pinheads.

Further experiments on *Pseudobalsamia microspora* demonstrated that, in general, copper sulphate remains the most promising means of control. *Sporendonema* sp. in soil was effectively controlled by zineb [30, p. 556], and also by phenyl mercury fixtan [32, p. 178], though mushrooms failed to grow after the latter treatment. Thiram did not check the disease.

Attempts to obtain experimental attacks of *Mycogone* [*perniciosa*: 32, p. 299] and *Verticillium* [*V. malthousei* and *V. psalliotae*: 30, p. 556] showed that the incidence of these diseases is dependent upon favourable environmental conditions, including high relative humidity and temperature, even in the presence of a heavy inoculum. There was some difficulty in establishing the diseases when the temperature averaged 15° C. and the humidity 58 per cent. but at 20° and 88 per cent. humidity both readily attacked the mushrooms. Zineb gave better control of both diseases than thiram. *Myceliophthora sulphurea* and possibly a variety of *M. lutea* appear to be associated with the verdigris and mat diseases [see below, p. 206].

Concentrations of less than 0·12 per cent. magnesium increase the rate of mushroom growth, while more than 1 per cent. has a deleterious effect. Poor crops obtained on vermiculite casing may be due to the high magnesium content of this material.

In the preface to the 1953 report it is stated that from the end of September, 1954, the activities of the Mushroom Research Station at Yaxley will be continued at the new Glasshouse Crops Research Institute, Toddington, Bedfordshire.

In experiments with various casing soil mixtures described by P. B. Flegg (pp. 8–20) it was shown that the addition of up to one third by volume of compost to soil increased the weight of mushrooms produced, but the addition of too great a proportion of compost encouraged the mycelium to permeate the casing to such an extent that watering became difficult and yield was considerably reduced.

R. L. Edwards (pp. 21–30) briefly outlines three cropping experiments, the first of which showed that under the conditions of the experiment the addition of peat [34, p. 75] to casing soil significantly improved the mushroom yield. Shallow casing cropped earliest but medium depth (3·4 cm.) gave the best yield. The second experiment was interrupted by diseases; it was noticed that brown plaster mould [*Papulospora byssina*, *Scopulariopsis fimicola*, and other fungi] and yellow mould

[*M. lutea* and other fungi] showed a marked tendency not to appear in the same beds. There was no significant difference in yield between peat-vermiculite and peat-sand casings. A mixture containing 75 per cent. sand was slightly superior to one without sand, and considerably better than one with 94 per cent. Experiments on the effects of ultra-violet radiation on the spores of various mushroom parasites were continued by Miss D. G. Gandy (pp. 31–37). Spore germination of *Dactylium dendroides*, *Mycogone perniciosa*, *V. malthousei*, *Trichoderma viride*, and *Penicillium* sp. was unaffected by 72 hours' exposure to radiation at 0·8 μw. per sq. cm. and largely inhibited by 3·6 μw. for 24 hours.

Experiments have failed to establish the causal agent of bacterial pit disease but *Pseudomonas* (?) *fluorescens* has been isolated from pits still covered by the outer membrane of the mushroom cap. At the Research Station bacterial pit does not develop until at least 60 days after the appearance of the first pinheads.

An attempt to clarify the usage of the terms 'verdigris' and 'mat disease' is made by R. L. Edwards and Miss D. G. Gandy (pp. 38–39). The name verdigris should only be applied where *Myceliophthora lutea* has been identified microscopically until the specific causal relationship between this fungus and other symptoms has been established. Mat disease was originally used to describe a severe form of verdigris [27, p. 215].

Gurlev (A. S.) & Platonova (Mme E. M.). Новые средства борьбы с паутинным клещиком и мучнистой росой на Огурцах. [New methods of controlling spider mite and powdery mildew on Cucumber.]—Сад и Огород [*Orchard & Garden*], *1954*, 7, pp. 23–24, 1954.

Colloidal sulphur (0·2 per cent.) alone or in combination with NIUIF–100 (0·03 per cent.), or the latter plus 0·05 per cent. copper sulphate, in addition to being lethal to insects and pests attacking cucumber, gave good protection from cucumber powdery mildew [*Erysiphe cichoracearum*: cf. *R.A.M.*, 32, p. 656] in the U.S.S.R.

Stoll (K.). **Untersuchungen über die nichtparasitäre Gurkenwelke.** [Studies on the non-parasitic Cucumber wilt.]—*Phytopath. Z.*, 22, 2, pp. 177–210, 10 figs., 1954.

This is a comprehensive report, supplemented by a six-page bibliography, on studies conducted at the Biological Institute, Berlin, in 1953 on a non-parasitic cucumber wilt characterized by symptoms resembling those of fusariosis (*Fusarium* sp. of the *Elegans* group) [*R.A.M.*, 29, p. 346; 31, p. 314] and tracheomycosis (*Erwinia tracheiphila*). The condition is attributed to the deleterious action on the root cortex parenchyma and the root hairs of various phytotoxic substances which tend to accumulate in the soil when improperly handled, e.g., cyanamide and free ammonia (the degeneration products of calcium cyanamide), hormonal herbicides, and contact insecticides, notably ruscalin, a mixture of physiologically active isomers with a hexa base manufactured by VEB Schering, Berlin-Adlershof. Directly consequent on this type of injury are disturbances in the water balance, which may be aggravated by exposure or abrupt changes of temperature in the root zone and occasionally lead to toxigenic changes near the vascular tissue, associated with blockage of water passage and culminating in sudden wilting and shrivelling.

Porter (C. A.). **Histological and cytological changes induced in plants by Cucumber mosaic virus (Marmor cucumeris H.).**—*Contr. Boyce Thompson Inst.*, 17, 8, pp. 453–471, 6 figs., 1954.

The effect of cucumber mosaic virus [*R.A.M.*, 32, p. 298] in the leaves of naturally and artificially infected, field and greenhouse cucumber and Clara Butt tulip, broad bean leaves and stems, and leaves of Croft Easter lily (*Lilium longiflorum*) affected by the fleck complex only, were studied at Oregon State College.

The initial changes originate in the mesophyll of affected leaves. Symptoms are confined to this tissue in mottled cucumber leaves but the necroses produced in the other species eventually involve other tissues. The yellow areas appear hyperplastic in young cucumber leaves and hypoplastic in mature ones. The plastids in both are reduced in size and number, aggregates are formed and may fuse into granular masses. The dark green, raised areas of mottled cucumber leaves result from hyperplasia in the mesophyll.

In Easter lily leaves necrosis is restricted primarily to the mesophyll; only when this has degenerated does it extend to the epidermal and vascular tissues. The entire protoplast degenerates into a homogeneous, coagulated mass deposited about the cell wall and the cells collapse almost simultaneously.

Necrosis in tulip leaves is restricted primarily to the mesophyll and does not involve vascular tissue until a late stage of mesophyll degeneration. The cells collapse only after complete protoplast degeneration.

In broad bean leaves necrosis spreads rapidly from the mesophyll to the epidermal and vascular tissues. In the stems it is at first restricted to the phloem of a single vascular bundle but soon becomes general. Protoplast degeneration proceeds as in Easter lily except that, as in tulip, it occurs before the cells collapse.

Gol'din (M. I.). Люминесцентно—микроскопический анализ вирусных включений в растительной клетке. [Fluorescent-microscopic analysis of the growing cell.]—Докл. Акад. Наук СССР [*C.R. Acad. Sci. U.R.S.S.*, N.S.], 95, 3, pp. 657–659, 1 col. pl., 1954.

Investigations at the Institute of Microbiology, U.S.S.R. Academy of Sciences, have shown that the use of the fluorescent microscope to study virus inclusions in the living cell is promising [cf. above, p. 167]. The following viruses were studied: various strains of tobacco mosaic virus [*R.A.M.*, 33, p. 701], *Plantago* mosaic virus [33, p. 203], cucumber mosaic virus 2 [strain of cucumber mosaic virus: 24, p. 400], and onion mosaic virus [24, p. 397].

After fixing in 1 per cent. aqueous picric acid for two or more hours or in 5 per cent. (even 1 per cent.) trichloroacetic acid for 5 to 10 minutes, the sections are treated with a fluorochrome for 15 to 30 minutes. All the crystalline inclusions examined produced analogous fluorescence with acridine orange, aurophosphine, and some other fluorochromes. Primuline was the least suitable, causing a pale yellow-green fluorescence of the protoplasm which completely masked that of the inclusions. Berberine sulphate also produced fluorescence of the protoplasm but the inclusions were brighter and therefore easily discernible. The clearest results were obtained with aurophosphine and acridine orange.

The other group of virus inclusions, X-bodies, did not fluoresce when treated with acridine orange but the crystalline inclusions in the same cells showed bright green fluorescence. Sections of onion with mosaic showed brownish-red X-bodies with a yellowish-orange centre. Certain X-bodies, the aggregates of paracrystals of virus particles, gave the same fluorescence as the crystalline inclusions.

Bawden (F. C.), Hamlyn (Brenda (M. G.), & Watson (Marion). **The distribution of viruses in different leaf tissues and its influence on virus transmission by aphids.**—*Ann. appl. Biol.*, 41, 2, pp. 229–239, 1954.

A brief report on these experiments at Rothamsted Experimental Station on the ultra-violet irradiation of White Burley tobacco leaves systemically infected with cabbage black ring spot virus from Early Snowball turnip or with henbane mosaic virus has been noticed from another source [*R.A.M.*, 33, p. 584]. Irradiation of tobacco leaves systemically infected with tobacco mosaic virus made little difference to the infectivity of the sap; even when the period of exposure was extended to 20 minutes it was still more than two-thirds as infective as that from the

non-irradiated half-leaf. The evidence indicates that the effects of irradiation on infectivity reflect the extent to which virus is inactivated in the epidermal cells, and the contrasting results with tobacco mosaic and the aphid-transmitted viruses suggest that those causing diseases of the mosaic type can occur in different relative concentrations in different parts of a leaf.

The only marked effect of irradiation on the transmission by fasted and unfasted *Myzus persicae* from turnip was a decrease to one-tenth in the number of transmissions following two minutes' infection feeding, a similar result being obtained with henbane mosaic virus from and to tobacco plants with fasted aphids only given two-minute infection feedings. Taking into account all feeding times with fasted and non-fasted aphids, henbane mosaic virus differed from ring spot in being transmitted less frequently from irradiated than from non-irradiated leaves. After infection feeding periods of one and 24 hours ring spot was transmitted with almost equal facility from both irradiated and unirradiated leaves, whereas henbane mosaic virus was transmitted much less frequently from the former. This difference is attributed to the behaviour of the aphids under the conditions of the experiments; they had been feeding on turnips, and transfer to tobacco may have altered their behaviour. The difference in numbers of transmissions from irradiated and non-irradiated leaves by aphids fed for 24 hours suggests that rather more than half the transmissions of henbane mosaic virus following long infection feedings on tobacco occur because of virus acquired from the epidermis. Transmissions of ring spot in this manner appear to be uncommon, and it would seem that *M. persicae* when colonizing turnips for protracted periods feed continuously on deep-seated tissues, from which they obtain the virus.

Experiments with sugar beet leaves infected with beet mosaic and beet yellows viruses [loc. cit.] gave further evidence that irradiation probably inactivates virus only in epidermal cells. Mosaic virus behaves like henbane mosaic virus in insect-transmission tests, but yellows does not. Too few transmissions of mosaic virus were obtained with aphids given long infection feedings for any conclusions to be drawn. That virus in the phloem is largely unaffected was suggested by results with sugar-beet yellows virus; of 54 aphids given infection feedings of four hours, 18 transmitted from non-irradiated and 14 from irradiated leaves.

The available evidence suggests that transmitted virus is only that present in the aphids' stylets when they are withdrawn from infected plants. The factor mainly responsible for the puzzling phenomena previously disclosed by experiments on aphid transmission of these viruses would appear to be the unequal distribution of readily extractable virus in different tissues of systemically infected leaves and its comparatively high concentration in epidermal cells.

KANNGIESSER (W.). **Eine Reaktion zur Erkennung einiger Viruskrankheiten auf Tabak.** [A reaction for the recognition of some virus diseases of Tobacco.]—*Naturwissenschaften*, 41, 13, pp. 307–308, 1 graph, 1954.

In experiments at the Institute for Applied Chemistry, Hann.-Münden, Germany, on the production of plant nucleic acid by decomposition of the nucleoproteins in expressed Samsun tobacco leaf sap with 10 per cent. sodium chloride solution, using the methods of Chargaff *et al.* (*J. biol. Chem.*, 186, p. 51, 1950), Signer and Schwander (*Helv. chim. acta*, 32, p. 853, 1949), and Frick (*Biochim. biophys. Acta*, 3, p. 103, 1949), material from plants infected by tobacco mosaic virus (yellow and Sumatra-Si strains), potato virus X [*R.A.M.*, 33, p. 552], and tomato mosaic virus (Lufa strain) remained turbid or opalescent for days whereas healthy sap was completely clear after standing overnight. Similar results followed the application of 10 per cent. acetic acid to tobacco sap that had been frozen and then thawed. The presence of tobacco mosaic virus in tomato plants was also detected by the same reaction.

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